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IMPROVING THE PROFESSIONAL SKILLS OF FUTURE TEACHERS THROUGH PROJECT-BASED LEARNING (PBL) IN THE CONTEXT OF GLOBALIZATION

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Abstract. *This article explores the impact of globalization processes on the education system and the theoretical foundations of enhancing the professional competence of future teachers. The research analyzes the unique characteristics and functions of pedagogical collaboration, along with modern requirements for the design of the educational process. It substantiates the methods for developing students' professional and personal qualities through Project-Based Learning (PBL), emphasizing the effective integration of information and communication technologies (ICT) and the organization of professional activities on a scientific basis. The article serves to strengthen the methodological preparation of future educators.*
Keywords: *project-Based Learning (PBL), professional skills, pedagogical collaboration, globalization and education, professional and personal qualities, information and communication technologies (ICT), evidence-based practice, educational project.*

Introduction. In the context of contemporary globalization, the significantly increasing demands placed on the cognitive activities of future teachers prioritize the development of their thinking-based skills. The core philosophy of the education model presented at the World Economic Forum, centered on the “4Cs: Critical Thinking, Creativity, Communication, and Collaboration” demonstrates the prerogative nature of these competencies in countries achieving high educational performance. This, in turn, necessitates the development of effective technologies for teacher training and continuous professional development, based on creating opportunities for future educators to design their activities, perform conscious analysis, enhance their cognition, and realize their creative potential.

A pedagogical goal is adopted as a pedagogical task during the preparatory stage of organizing the educational process. The success of pedagogical activity depends on the simultaneous and sequential comprehension of the essence of various tasks. Specifically, in vocational teacher training, it is crucial to categorize pedagogical tasks into general (common to all pedagogical activities), staged (reflecting the essence of specific phases of the pedagogical process), and specialized (situational and emergent), while ensuring students are prepared to execute them. Timely recognition and fulfillment of these tasks foster a correct professional approach. In an era where the teaching methodology of any discipline is inseparable from the pedagogical sphere, achieving these goals and tasks helps explain the underlying drivers of active teaching and learning processes.

Indeed, today's effective education is oriented toward learning outcomes rather than time spent. The traditional educational system, focused on memorizing and retaining terms, facts, and concepts, is yielding its dominance to student-centered learning that prioritizes cognitive activation, practical skill development, and independent activity. Consequently, it is becoming increasingly urgent to create an educational environment that facilitates a competency-based approach, providing a solid foundation for preparing graduates who possess critical and creative thinking and can fully realize their intellectual potential.

The issue of activating the learning and cognitive activities of students has been studied, interpreted, and theoretically substantiated by various researchers through the lens of their respective eras and scientific paradigms. Over time, specialized research has focused on modernizing and adapting the forms, methods, and tools of instruction to the age and individual characteristics of learners, as well as creating specific pedagogical and psychological conditions for education.

In recent years, as a result of such research – particularly in international methodologies – a series of instructional principles (continuity, individualization and differentiation, modularity, variability, reflexivity, scientific-methodological supervision, electivity, and integrativity), approaches (competency-based, innovative, creative, student-centered, communicative, and cognitive), and instructional models (problem-based learning, person-centered learning, inquiry-based learning, active learning, and Project-Based Learning) have been successfully implemented. These advancements are uncovering new horizons in educational development.

Research Objective. This work presents the role of Project-Based Learning (PBL) in a teacher's professional activity, an analysis of national and foreign scientific research, an original definition of PBL, and its structural elements.

A Brief Analysis of Scientific Research on the Topic of Investigation. Based on the objective of our research, we analyzed the essence of Project-Based Learning (PBL) and its study in the educational methodologies of our republic and foreign countries as a source of pedagogical inquiry.

In our republic, one can witness numerous investigations into design technology within field-related research. In particular, U. Tolipov noted that "designing the pedagogical process is the creation of a project that serves to integrally express the general essence of pedagogical activity organized on the basis of the project-content-activity triad. In projects, analytical activities carried out sequentially by the pedagogue and ending with the diagnosis are manifested: creative activities such as foresight and design". Researcher M.H. Mahmudov and several scholars, in developing the problem of design in the theory of pedagogical education, put forward views expressing its inseparable connection with the concept of "activity" and that it consists of creating tentative variants of activities and diagnosing their results. Specifically, while applying pedagogical technologies in education, Professor U. Tolipov dwells in detail on each task and stage of pedagogical process design technology, the role of the teacher, the laws, principles, and strategies of educational process design, and the levels and essence of design in general secondary education.

A.R. Hamroyev, who worked on designing the creative activity of students in mother tongue education, emphasizes the need to clarify the content of activity organized mainly by an individual student and a group of students, rather than just the pedagogue's activity or the content and possibility of using pedagogical tools; the research conducted by the scholar is aimed at designing mother tongue lessons.

Scholar B.B. Mamurov, who researched the system of developing educational process design skills in future teachers based on an acmeological approach, points out that future teachers must possess the knowledge and skills required to effectively design the educational-training process in schools. We have improved them as follows:

- Knowledge and concepts related to designing the educational process;
- Knowledge related to improving the pedagogical process project;
- Understanding the specific characteristics and functions of pedagogical collaboration;
- Requirements for the educational-training process project;
- Ways to improve professional mastery;
- Methods for developing pedagogical activity;
- Mastery of professional and personal qualities;
- Knowing the ways to use the possibilities of information and communication technologies in the educational-training process;
- Having the skill to apply ways of organizing their professional activities on a scientific basis;
- Having the skill of systematization, modeling, construction, bringing to a single standard, and creating secondary didactic projects in designing the educational process based on an acmeological approach.

The mentioned ideas regarding design and design technology have penetrated and clarified the structural parts from planning the general pedagogical process and designing education to private design – the lesson process that brings about educational cognition. Although the scientific research of the researchers and scholars whose views were analyzed above served as a main factor in the development of educational practice, the Project-Based Learning expressed in our research objective differs by being based on foreign methodology and having distinct characteristics. Such analyses can be found in the research conducted by G. Fayzullayeva regarding the continuous professional development of teachers. In her opinion, “Project-Based Learning (PBL) is an educational approach that has been formed, developed, and improved over the years, acquiring a new form and content, and increasing its level of vitality”. She also notes that types of Project-Based Learning emerging at the level of small projects can distract the teacher, researcher, and learner from looking at it more deeply and seriously. She analyzes the comparative table published on the electronic learning platform of TeachThought – an organization dedicated to innovation in education through the growth of outstanding teachers founded by Amy Mayer – and expresses an authorial attitude toward them, researching the common and distinct aspects of a “project” and “Project – Based Learning”.

Researcher N. Yusufjonova, who dealt with the problems of assessing students' knowledge, in her article "Problems of Introducing Teaching and Assessment Based on the PBL Strategy into the Higher Education System," substantiates the necessity of radically renewing control types through scientific-pedagogical principles related to changing the assessment system. She argues for redeveloping curricula based on the PBL (Project – Based Learning) strategy currently being implemented in leading foreign higher education institutions, Bloom's Taxonomy, and dynamic educational criteria that do not recognize the boundaries of lesson hours, classrooms, and disciplines. According to the researcher, the main innovation of Project – Based Learning in organizing and assessing control work is determined by its impact on the human factor. In this, the student's attitude, opinion, and worldview toward themselves, their teacher, and their classmates change. Additionally, it can be seen that the final target of the Project-Based Learning strategy

consists of practice and sharing what one has learned with others. Assessment in the new way is recognized not as the end point of the educational process, but as a means of directing students to the next stages of cognitive processes.

During our research, it was considered important to more broadly clarify the theoretical-methodological foundations of Project-Based Learning, which is recognized today as a foreign methodology, to analyze its state in practice, and to dwell on the main content expressed in the recent research of foreign scholars regarding Project-Based Learning. Based on these, it was deemed essential to create an authorial definition, express an attitude, and further clarify the distinct sides of Project-Based Learning.

Thus, Project-Based Learning reflects a variable classroom-lesson approach designed on the basis of lifelike, real problems, where the acquisition of deep knowledge is guaranteed through active learning. As acknowledged by Yasseri Dar, Patrick M. Finley, Blayne E. Mayfield, David W. Davis, and others, PBL is built on the core of an educational style based on active learning and inquiry, as opposed to relying on paper, memorization, and teacher-led instructions; it shows a smooth way of acquiring knowledge by presenting clear evidence or asking questions, posing problems, and proposing their scenarios.

John Larmer, John Mergendoller, and Suzie Boss state that Project-Based Learning is a powerful teaching approach, through the implementation of which the following are achieved:

- It motivates students to acquire knowledge;
- It prepares pupils and students for higher education, careers, defining professional growth points (planning an individual professional trajectory), and socially active citizenship;
- It helps pupils and students to perform tasks well that require demonstrating deep knowledge and thinking abilities (in our opinion, fulfilling the social order for the teacher);
- It provides teachers with the opportunity to teach in a more satisfying manner;
- It provides educational organizations with new ways of communicating and connecting not only with parents and other communities but with the whole world.

According to Thom Markham, “PBL integrates knowing and doing; students acquire core knowledge, skills, and competencies from the curriculum being studied, and as a result, they apply what they know in practice to solve real-life problems and achieve significant results.

PBL focuses education on the student, not the curriculum; it uses digital tools to produce high-quality collaborative products and rewards students with intangible wealth such as global progress, creativity, emotional stability, resilience, and empathy required in today's world. Of course, these cannot be taught outside of textbooks, but they must be activated through experience,” he describes. As a result of studying and observing the "https://www.pblworks.org/" electronic platform organized by the Buck Institute for Education – which prepares students for the real reality in their profession based on Project-Based Learning and is designed to provide methodological assistance to teachers – and analyzing the work carried out, we improved the comparative table reflecting the distinct aspects of the concepts "doing a project" (conceived by the teacher, directed at their clear instructions and diagnosis) and "project-based learning" (real-life occurrences in professional life, where the achieved or created product/presentation is necessary for others to use in practice) with an authorial attitude (Table 1):

The following definition can also be found on this electronic platform: Project - Based Learning (PBL) is a teaching method in which students work for an extended period to investigate and respond to an authentic, engaging, and complex question, problem, or challenge, thereby acquiring deep knowledge and essential skills.

Table 1. Comparative table of the content of "Doing a Project" and "Project-Based Learning"

Doing a Project (Traditional)	**Project-Based Learning (PBL)**
Executed within a strictly defined short period.	Long-term (conducted over a week, a month, or an entire semester).
An additive unit or supplement to instructions, used to activate a traditional program.	A project created based on an integrated manual (the Project is the core unit).
Based on a rigid direction strictly defined by the teacher.	Driven by student proposals and inquiry.
Aimed at a pre-diagnosed result (product).	Centered on the result (product) as well as the teaching and learning throughout the process.
In many cases, not directly linked to required standards and competencies.	Aligned with academic standards and skills that ensure success.
Can be performed individually or in groups, within the auditorium or as home assignments.	Executed in collaboration with students; it also incorporates teacher guidance determined by real-time classroom dynamics during implementation.
Remains within the boundaries of the auditorium or the school environment.	Content (context) and programs are created for the needs of the real world.
The final result of the project is shown only within the auditorium or classroom.	Project results are shared with the class and a relevant public audience.

According to the views of researcher and trainer Terry Heick on his blog (TeachThought), there are three primary types of Project-Based Learning:

1. Challenge-Based Learning / Problem-Based Learning
2. Place-Based Education
3. Activity-Based Learning

Challenge-Based Learning is an engaging interdisciplinary approach to teaching and learning that encourages students to use the technologies necessary in their daily lives to find solutions to real-world problems existing in their homes, schools, and communities. According to the scholar, if any project is aimed at solving a specific challenge and leads to development through measurable results, it manifests as authentic Project-Based Learning. Place-Based Education (or ethnically grounded education) immerses students in local heritage, cultures, landscapes, opportunities, and experiences. This type of instruction serves as a foundation for studying language arts, mathematics, social sciences, and other disciplines, emphasizing learning through community participation in local school or service projects. Activity-Based Learning is designed primarily for hands-on, practical exercises. Researcher Lawrence Haywood, who applies Project-Based Learning in working with students across various school subjects, notes that students solve the large-scale problem posed in a project step-by-step. During this process, "pauses" or minor failures may occur at each stage. Every encounter with failure helps students identify their areas of ignorance, recognize their mistakes, and understand what actions are required for correction. Thus, PBL is a natural process in schools that creates a need to revisit and learn core knowledge. He

emphasizes that a classroom and its students cannot be transitioned to PBL instantaneously; the teacher should start at the simplest level and gradually move toward large-scale, long-term projects. Teamwork is a vital criterion in Project-Based Learning. From this perspective, orienting program formation and process organization toward this criterion creates a foundation for developing collaboration, defining the responsibility of each participant, correctly distributing time, fostering a critical attitude toward every element, creating a necessity for thinking, proposing independent solutions to problems, and strengthening openness to the opinions of teammates. Another positive aspect of PBL is that since conducting research, designing, planning, implementing, and correcting are integral components, students gain the opportunity to test their skills and competencies through experience.

Discussion and Authorial Definitions. The investigations and analyses conducted during the research, as well as the hypothesis put forward, allowed for the formulation of an original definition of Project-Based Learning technology: Project-Based Learning is a results-oriented technology that clarifies the pedagogical-psychological characteristics of developing the creative thinking of future teachers, reveals didactic possibilities, and functions through driving questions, sustained effort, deep inquiry, authenticity, student voice and choice, reflexivity, and critical thinking.

Key Elements of PBL

- Challenging Problem or Driving Question: Constructing a meaningful problem to be solved or a question that requires an answer.
- Sustained, Deepening Inquiry: Engaging in an extended process of asking questions, finding resources, and applying information.
- Authenticity: Incorporating real-world contexts, tasks, tools, standards, interactions, personal concerns, interests, and problems.
- Student Voice and Choice: Making certain decisions regarding the project, analyzing them, testing their functionality, creating, and expressing ideas.
- Reflection: Thinking about the effectiveness of learning, inquiry, and project activities, the quality of student work, emerging obstacles, and strategies to overcome them.
- Critique and Revision: Providing mutual feedback to improve existing processes and products, consulting with the teacher, and perfecting the work.
- Public Product (Presentation): Making the project transparent by sharing, explaining, or presenting it to others.
- The experience inherent in Project-Based Learning aids future teachers in avoiding potential problems in developing creative thinking while utilizing knowledge. It allows PBL to be evaluated as a positive pedagogical phenomenon characterized by efficiency and effectiveness.

Conclusions

- In the process of transformation into a knowledge-based society, educational institutions lose their status as the sole source of information; instead, a person's worldview, talent, qualifications, adaptability to change, ability to extract necessary information from various sources, and cognitive capabilities become priority factors.
- Project-Based Learning cannot be implemented within the boundaries of a single lesson; it encompasses the entire process related to instruction, including the formulation of learning objectives, planning, the correct selection of content, forms, and tools, assessment, scientific-methodological support, and the provision of flexible timelines.

- In the PBL process, the teacher moves away from the center; their role shifts from being the primary provider of knowledge to becoming a facilitator, consultant, guide, and organizer of feedback, creating conditions for student independence, cooperation, freedom, and cognitive development.
- The priority of teamwork in the process allows students to develop independent thinking, decision-making, the ability to justify choices and explain them to teammates, the presentation of clear evidence, constructive communication, active listening, respect for others' opinions, adaptability, and communicative skills.

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A THREE-LAYER MODEL FOR UNDERSTANDING MATHEMATICAL TEXT: THESAURUS – SEMANTICS – SEMIOTICS

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Abstract. *Mathematical text is one of the principal means through which mathematical knowledge is transmitted, acquired, and internalized in higher education. However, students often experience considerable difficulties in reading and understanding such texts because mathematical discourse combines verbal explanations, symbolic expressions, logical statements, definitions, theorems, proofs, graphs, tables, and problem situations. These difficulties are especially evident in mathematical analysis, where successful learning requires not only memorizing definitions and formulas, but also understanding conceptual relations, recognizing conditions of applicability, interpreting symbolic notation, and moving between different forms of representation. The present article addresses the problem of developing a methodological framework for supporting students' comprehension of mathematical texts. The study proposes a three-layer model for understanding mathematical text based on the integration of thesaurus, semantic, and semiotic approaches. The semiotic layer focuses on interpreting various representational forms of mathematical information, including verbal, symbolic, graphical, and tabular registers. The semantic layer is concerned with identifying meaningful and logical relations between mathematical concepts, such as genus–species, part–whole, precondition, equivalence, cause–effect, and counterexample or negation relations. The thesaurus layer represents the formation of a structured system of mathematical concepts in the learner's mind. The research is based on theoretical and conceptual analysis of mathematical texts, particularly texts used in mathematical analysis courses. The results show that understanding mathematical text should be viewed as a multi-level cognitive process in which symbolic interpretation, semantic linking, and conceptual systematization interact with one another. The proposed model can serve as a methodological basis for designing learning tasks, diagnostic tools, and instructional strategies aimed at developing students' ability to work independently with mathematical texts. The model also contributes to improving students' mathematical thinking by helping them transform fragmented information into an integrated system of knowledge.*

Keywords: *mathematical text, mathematical analysis, thesaurus approach, semantic relations, semiotic registers, mathematical comprehension, educational information.*

1. Introduction

In mathematics education, mathematical knowledge is transmitted to students primarily through texts. Such texts consist of various elements: definitions, theorems, proofs, rules and algorithms, examples, graphs, figures, and explanations. The totality of these elements constitutes the logical structure of this knowledge.

A student's ability to work with mathematical text is an important condition for the successful mastery of mathematical disciplines. However, teaching experience and existing research show that students often encounter significant difficulties in reading and understanding mathematical texts (Mesa & Griffiths, 2020).

The most common difficulties include the following (Turgunbayev & Umaraliyeva, 2023):

- inability to distinguish mathematical terms;
- failure to understand the differences between definitions and theorems;
- inability to correctly identify the logical relationships between concepts;
- misinterpretation of mathematical symbols.

In the methodology of mathematics teaching, there are various theoretical approaches aimed at explaining the process of understanding mathematical information on a scientific basis.

For example, R. Duval emphasizes that mathematical thinking is closely related to the use of different semiotic registers, that is, different forms of representation (Duval, 2006). According to his theory, understanding mathematical objects develops through transformations between different forms of representation.

APOS theory explains the cognitive process of mathematical concept formation and describes the development of mathematical knowledge through the sequence of action, process, object, and schema (Arnon, 2014).

In addition, the thesaurus approach plays an important role, according to which knowledge is viewed as a system of interconnected concepts (Turgunbayev, 2021, 2022).

Despite the existence of these theoretical approaches, integrative models describing the process of understanding mathematical text in contemporary mathematics education methodology remain insufficiently developed.

The aim of this study is to develop a three-layer integrative model for understanding mathematical text based on the integration of thesaurus, semantic, and semiotic approaches.

2. Theoretical Foundations of the Study

2.1. The Concept of Mathematical Text

Mathematical text is a system of logically connected elements through which mathematical knowledge is conveyed.

The main elements of mathematical text include definitions, theorems, proofs, rules and algorithms, formulas, problems, graphs, and figures. Each of these elements performs a specific function within the structure of mathematical knowledge.

For example, definitions introduce new mathematical concepts, theorems express the properties of mathematical objects, and proofs substantiate the truth of these properties.

Thus, mathematical text constitutes a structured system of knowledge.

2.2. The Thesaurus Approach in Mathematics Education

The thesaurus approach considers knowledge as a system of concepts and the relationships between them (Turgunbayev, 2022).

Within this approach, mathematical knowledge can be represented as a conceptual network consisting of mathematical concepts, logical relations between them, and a hierarchy of concepts. The formation of a mathematical thesaurus helps to build a system of interconnected concepts in the student's mind (Naykhanova, 2008; Sowa, 2000).

For example, when studying the topic of bounded sets, the following system of concepts is formed in students' vocabulary: set, upper bound, lower bound, supremum, infimum, bounded set.

2.3. Semantic Relations Between Mathematical Concepts

Relations between concepts are multifaceted (Naykhanova, 2008), and from the perspective of mathematics teaching methodology, it is advisable to identify the most essential ones. The main types of such relations include: genus–species, part–whole, cause–effect, precondition, equivalence, and counterexample/negation.

2.4. Semiotic Registers in Mathematics

According to Duval's theory, mathematical information is represented in different forms (Duval, 2006). The main registers are presented below (Table 1).

Table 1. Main Registers

Register	Example
Verbal	definition text
Symbolic	mathematical formulas
Graphical	coordinate axis
Tabular	table of values

According to R. Duval's theory, the understanding of a mathematical object is formed through transformations of information across registers.

3. Research Methodology

The research is based on theoretical and conceptual analysis methods.

The main objectives of the study were defined as follows:

- to analyze the structure of mathematical texts within the mathematical analysis course.
- to identify mathematical concepts and their semantic relationships.
- to analyze various forms of representation of mathematical information.
- to develop an integrative didactic model.

4. Research Results

4.1. Structure of Mathematical Text

The analysis showed that mathematical text usually has the following structure:

terms → definitions → theorems → proofs → examples

This sequence reflects the logical development of mathematical knowledge.

4.2. Semantic Network of Concepts

Mathematical concepts form a semantic network.

For example:

Set E
↓
upper bound
↓
supremum

4.3. A Three-Layer Model for Understanding Mathematical Text

Based on the analysis, the following model was developed.

1. **Semiotic layer** – this layer is associated with the interpretation of different forms of representation of mathematical information. These include textual descriptions, mathematical symbols, and graphical images.
2. **Semantic layer** – at this level, logical relationships between mathematical concepts are established.

3. **Thesaurus layer** – at this level, the student's system of mathematical knowledge is formed.

5. Discussion

The obtained results make it possible to consider the process of understanding mathematical text as a complex cognitive process involving several interconnected levels of information processing. The proposed model shows that understanding mathematical text is not limited to interpreting symbols or mastering mathematical concepts. Rather, it develops through the interaction of several cognitive mechanisms.

First, the interpretation of symbolic forms of mathematical information plays an important role. According to R. Duval's theory of semiotic registers, mathematical thinking is impossible without transformations between various forms of representation, such as symbolic notation, graphical representation, and verbal description. The ability to transform information across different registers is one of the main conditions for understanding mathematical objects (Duval, 2006).

Second, identifying semantic relationships between mathematical concepts is of great importance. Mathematical knowledge is organized not as a collection of isolated facts, but as a system of interconnected concepts and statements. Therefore, understanding mathematical text includes the ability to identify logical relationships between mathematical objects. Research on cognitive processes in mathematics emphasizes that constructing such relationships is an important element of mathematical thinking (Harel & Koichu, 2021; Tall, 2013).

Third, understanding mathematical text is connected with the formation of a system of mathematical concepts, or a mathematical thesaurus. Within the framework of the thesaurus approach, knowledge is viewed as a network of interconnected concepts. The formation of such a network ensures a holistic understanding of mathematical content.

The integration of these three aspects makes it possible to consider understanding mathematical text as a multi-level cognitive process. Unlike existing approaches, which usually focus either on the semiotic aspects of mathematical thinking or on the cognitive mechanisms of concept formation, the proposed model integrates several theoretical directions in contemporary mathematics education methodology.

The obtained results are consistent with studies devoted to students' reading of mathematical texts. For example, studies by M. Inglis and L. Alcock show that students and experts use different strategies when reading mathematical proofs (Inglis & Alcock, 2018; Lithner, 2017; Selden & Selden, 2017). Experts pay more attention to the structure of proofs and the relationships between mathematical statements, whereas students often focus on individual symbolic expressions.

Similar results were obtained in K. Weber's studies on strategies for reading mathematical proofs. These studies show that successful understanding of mathematical text requires active analytical work, including the identification of logical relationships and the interpretation of mathematical symbols (Weber & Mejía-Ramos, 2019).

Thus, the research results confirm that the development of students' skills in working with mathematical texts requires specially organized learning activities aimed at developing various aspects of understanding mathematical information.

The developed model may serve as a theoretical basis for designing a methodology for teaching mathematical analysis aimed at forming the following skills in students:

- analyzing the structure of mathematical text;

- identifying semantic relationships between mathematical concepts;
- interpreting various forms of representation of mathematical information;
- constructing conceptual schemes of mathematical knowledge.

The development of these skills contributes to students' ability to work independently with mathematical texts and to acquire mathematical knowledge more effectively.

6. Conclusion

This article presents a three-layer model for understanding mathematical text based on the integration of thesaurus, semantic, and semiotic approaches.

The proposed model shows that understanding mathematical text is formed through:

- interpretation of the forms of representation of mathematical information;
- identification of logical relationships between concepts;
- formation of a system of mathematical knowledge.

The scientific novelty of the study is as follows.

An integrative model for understanding mathematical text was developed based on the combination of three cognitive components involved in understanding mathematical information: semiotic, semantic, and thesaurus-based.

It is shown that understanding mathematical text is formed through the interaction of three cognitive processes:

- interpretation of symbolic representations of mathematical information;
- identification of meaningful relationships between mathematical concepts;
- formation of a system of mathematical knowledge.

A structure for analyzing mathematical text is proposed that enables the identification of semantic relations between mathematical concepts and their use in teaching mathematical analysis.

The study demonstrates that the proposed model can be used as a methodological basis for developing students' skills in working with mathematical information.

The results of the study can be used in developing methodologies for teaching mathematical analysis, creating learning tasks aimed at improving skills in working with mathematical texts, and designing diagnostic materials.

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DIALOGIC TEACHING'S IMPACT ON ENGLISH LANGUAGE LEARNERS' SPEAKING SKILL

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Abstract. *The purpose of this paper is to examine how dialogic teaching affects the development of English language learners' speaking and critical thinking abilities. The study addresses the problem that many pupils experience difficulty expressing themselves effectively and confidently in classroom communication, both in academic and everyday contexts. Three instruments were used to collect data for the study: an observational checklist, an interview, and a questionnaire. The questionnaire was administered to pupils whose language proficiency level was A2. Both quantitative and qualitative methods were used to analyze the collected data. The findings indicate that dialogic teaching helps students develop discussion, questioning, reasoning, and argumentation skills, all of which support the improvement of speaking and critical thinking abilities. The results also show that authentic elements of dialogic teaching are effective when students are given sufficient time and opportunities to practice communication. Therefore, the study suggests introducing learners to various communication techniques, including dialogue, discussion, reasoning, and questioning, in order to help teachers apply the dialogic teaching approach more effectively.*

Keywords: critical thinking abilities, English language learners, dialogic teaching, speaking skill, classroom communication.

Introduction

Pupils at school often have difficulty expressing themselves effectively and confidently in class, whether they are discussing academic topics or everyday matters. According to previous studies, the dialogic teaching approach is one of the most effective strategies for improving classroom interaction because it creates educational opportunities through teacher-student communication and allows students to participate actively in classroom discussion [12;98].

In order to foster mutually responsive learning in the zone of proximal development, dialogic teaching emphasizes collective, reciprocal, supportive, cumulative, and purposeful interaction. It also highlights the importance of cooperative group work and peer support. Over the past three decades, empirical classroom research has shown that classroom discourse is often monologue-based, teacher-controlled, and teacher-shaped. Therefore, a significant change in classroom practice is needed in order to promote active engagement and improve learners' proficiency.

Dialogic teaching has emerged as an important approach in this context. Alexander defines dialogic education as a process of understanding students' thoughts, interacting with their developing ideas, and facilitating communication through creative classroom activities [1;62]. Dialogic teaching can be understood as an identifiable approach to instruction that uses speech effectively in teaching and learning. It involves continuous communication between teachers and learners and differs from casual informal talk, traditional question-answer patterns, and listen-tell forms of instruction. It should not be confused with the official use of the term "speaking and

listening" in England, because that term usually focuses only on learners' speech as part of English teaching, whereas dialogic teaching is connected with interactive instruction across the curriculum.

Dialogic teaching is based on the principles of collectivism, reciprocity, support, cumulation, and purposefulness. It draws on a long tradition of observational and process-product research on teaching, as well as psychological and neuroscientific studies of children's development and cognition. The approach is connected with the works of Cazden [8;120], Bakhtin [6;78], Barnes, Mercer, Bruner [7;34], and later developments in activity theory and cultural psychology. Dialogic teaching has been widely practiced in Yorkshire, London, and other parts of Britain.

According to Alexander [2;6], dialogic teaching is founded on several pedagogical values connected with the aims of education, the nature of knowledge, and the relationship between teachers and students. Teaching as transmission views education as the process of helping children receive, reproduce, and apply basic knowledge and skills. Teaching as initiation sees education as the transfer of high-status cultural knowledge in areas such as the humanities, sciences, literature, and the arts. Teaching as negotiation reflects Deweyan theory, according to which teachers and students collaborate to create knowledge and understanding rather than relating to each other only as authority and passive recipient.

Teaching as facilitation is guided by developmental principles and emphasizes the learner's readiness and individuality. Teaching as acceleration is related to the Vygotskian idea that education should lead development rather than merely follow it. Teaching as method focuses mainly on structure, economical use of time and space, carefully organized tasks, regular assessment, and clear feedback. In this case, teaching effectiveness is considered important regardless of broader social or cultural values.

Dialogic teaching is not a single technique but a professional strategy and outlook. It requires teachers to reconsider both the methods they use and the dynamics of classroom interaction. Like all effective instruction, dialogic teaching is based on facts and ideas. It uses a wide range of methods and approaches, and the teacher applies this repertoire according to educational contexts, learning goals, student needs, and the nature of the subject matter. In short, dialogic teaching consists of repertoires for everyday talk, learning talk, teaching talk, academic talk, and classroom organization.

Alexander identified several important components of dialogic teaching, including talk about daily life, the acquisition of communication skills, educational discourse, and classroom organization [3;112–113]. The concept of repertoire is central because no single method can achieve all teaching goals. Dialogic teaching combines different repertoires and uses them flexibly according to the situation and purpose. Sociolinguists define everyday talk as discourse that supports normal human interaction. According to Mercer and Littleton, the teacher plays a crucial role in establishing classroom culture and creating opportunities for students to build on each other's ideas [10;65].

Mercer and Hodgkinson distinguish between presentational talk and exploratory talk. Presentational talk usually assesses comprehension and emphasizes correct answers, whereas exploratory talk allows learners to share, test, and develop ideas without fear of being mocked or strongly rejected [11;98–100]. In dialogic education, students do not merely identify the answers they think the teacher wants to hear. Instead, they learn to narrate, explain, analyze, speculate, imagine, explore, evaluate, discuss, argue, justify, and ask their own questions.

The word dialogue comes from the Greek roots *dia* and *logos*, which refer to meaning moving through interaction. Dialogue is generally understood as conversation between two or more people for the purpose of exchanging ideas. Many thinkers from both Eastern and Western traditions have interpreted dialogue in different ways. Socrates used dialogue as a means of developing social consciousness. Martin Buber connected dialogue with education and spirituality. David Bohm proposed dialogue as a way to develop mental wholeness. Paulo Freire also used the idea of dialogue in his "pedagogy of the oppressed."

Alexander distinguishes dialogue from mainstream oral or "interactive" teaching as it is often understood by teachers [4;27]. He describes several types of teacher discourse: rote, recitation, instruction or exposition, discussion, and dialogue. Rote involves the repetition of information, concepts, and procedures. Recitation builds knowledge and comprehension through questions that assess or encourage recall. Instruction or exposition involves giving instructions, explaining procedures, and presenting facts or principles. Discussion allows the sharing of ideas for problem-solving and information exchange. Dialogue uses systematic and cumulative inquiry to reach shared understanding.

According to Bakhtinian theory, dialogue is not simply a form of speech but a phenomenon that exists in the very structure of words themselves [5;34]. Wegerif argues that spoken or written expressions are filled with the voices of others and do not always result in simple synthesis or final agreement [13;350]. Alexander's concept of an emerging pedagogy of talk is similar to the view that attention should be given not only to the questions teachers ask but also to how teachers respond to students' answers [3;112–113].

Dialogic approaches to teaching and learning have strong potential beyond whole-class instruction. Small-group learning may be one of the best settings for exploring cognitively stimulating discourse. However, such approaches are not always widely recognized by educators as effective tools for developing understanding and critical thinking [9;19–25]. Creating effective group-working tasks and conditions is often more difficult and time-consuming than using traditional independent or didactic approaches. This may also result from teachers' limited knowledge of how to scaffold conversation and what role they should play in supporting student talk.

Language learners often struggle to communicate effectively and confidently when discussing both academic and everyday topics. Therefore, this study aims to determine how dialogic teaching affects English language learners' speaking skills and critical thinking abilities. The study is based on the idea that communicative talk is one of the most effective ways to support teaching and learning. Dialogic teaching is more than teacher presentation; it involves continuous communication between the teacher and students. At the same time, dialogic instruction may face challenges related to pupils' motivation and insufficient fluency.

Materials and Methods

This study investigated the impact of dialogic teaching on English language learners' speaking skills and critical thinking abilities. The research focused on pupils whose English language proficiency level was A2. The study used three main data collection instruments: an observational checklist, an interview, and a questionnaire.

The observational checklist was used to examine how pupils participated in classroom communication during dialogic teaching activities. It helped identify learners' involvement in discussion, questioning, reasoning, argumentation, and interaction with peers and the teacher. The interview was used to collect qualitative information about learners' attitudes toward dialogic

teaching and their difficulties in classroom communication. The questionnaire was administered to A2-level pupils in order to gather data about their speaking confidence, participation, and perception of dialogic activities.

Both quantitative and qualitative approaches were used to analyze the collected data. Quantitative analysis was applied to the questionnaire results, while qualitative analysis was used to interpret the interview responses and classroom observation data. This mixed approach made it possible to examine not only measurable changes in learners' participation but also their experiences, attitudes, and difficulties during dialogic teaching.

Results. The analysis of the collected data showed that dialogic teaching had a positive influence on English language learners' speaking skills and critical thinking abilities. The findings demonstrated that pupils became more active in classroom communication when they were given opportunities to participate in dialogue, discussion, reasoning, and questioning activities.

The observational checklist showed that dialogic teaching encouraged learners to take part in classroom interaction more frequently. Pupils were able to express their opinions, respond to questions, ask their own questions, and participate in discussions. These activities supported the development of speaking fluency and confidence. The questionnaire results indicated that A2-level pupils benefited from dialogic teaching because it gave them more opportunities to practice speaking in meaningful contexts. Learners showed improvement in their ability to discuss ideas, provide reasons, and participate in communication with classmates and the teacher. The interview responses also showed that pupils found dialogic activities useful because they helped them overcome hesitation and become more confident in expressing their thoughts.

The results suggest that dialogic teaching supports the development of discussion, questioning, reasoning, and argumentation skills. These skills are important not only for speaking development but also for the growth of critical thinking abilities. In general, the findings show that authentic dialogic teaching elements work effectively when students have enough time and practice.

Discussion. The findings of this study confirm that dialogic teaching can be an effective approach for improving English language learners' speaking skills. One of the main reasons for this effectiveness is that dialogic teaching creates a communicative classroom environment where learners are encouraged to speak, ask questions, explain their ideas, and respond to others. Unlike traditional teacher-centered instruction, dialogic teaching gives students a more active role in the learning process. The results also show that dialogic teaching supports critical thinking. When learners participate in dialogue, they do not simply repeat information or provide short answers. Instead, they analyze ideas, compare opinions, justify their responses, and engage in reasoning. These processes help students develop higher-level thinking skills together with speaking skills.

Another important point is that dialogic teaching allows learners to practice language in meaningful situations. Speaking skill cannot be developed only through memorization or mechanical exercises. Learners need opportunities to use language for real communication. Dialogue, discussion, questioning, and argumentation provide such opportunities and help learners become more confident speakers. However, the study also indicates that dialogic teaching may face some challenges. Some pupils may lack motivation, while others may have insufficient fluency to participate actively in discussion. Teachers may also need more preparation and methodological knowledge to organize effective dialogic activities. Group work, exploratory talk, and classroom discussion require careful planning, clear instructions, and supportive teacher guidance. Therefore, dialogic teaching should be introduced gradually and systematically.

Teachers should create a safe classroom atmosphere where pupils are not afraid of making mistakes. They should also use tasks that encourage learners to express opinions, ask questions, give reasons, and respond to classmates. In this way, dialogic teaching can become a practical tool for developing both speaking competence and critical thinking.

Conclusion. Dialogic teaching has a positive impact on English language learners' speaking skills and critical thinking abilities. The study showed that learners benefit from classroom activities based on dialogue, discussion, reasoning, questioning, and argumentation. These activities help pupils become more active, confident, and reflective participants in classroom communication. The findings suggest that dialogic teaching is more effective when students are given enough time and opportunities to practice communication. It also requires teachers to use appropriate methods, organize meaningful interaction, and support learners during classroom talk. Although challenges such as low motivation and inadequate fluency may occur, dialogic teaching remains a valuable approach for improving speaking skills among English language learners.

It is recommended that teachers introduce a wider range of communicative techniques, including dialogues, discussions, reasoning tasks, and questioning activities. These techniques can help learners improve their speaking abilities and develop critical thinking skills. Future studies may examine the long-term effects of dialogic teaching on learners of different proficiency levels and in different educational contexts.

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PEDAGOGICAL AND PSYCHOLOGICAL FEATURES OF DEVELOPING LINGUISTIC COMPETENCES IN FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *This article analyzes the pedagogical and psychological characteristics of developing linguistic competencies in prospective primary school teachers. Linguistic competence is considered one of the key factors ensuring high-quality education in primary school, and its formation is shown to be directly related to the teacher's speech culture, linguistic knowledge, communicative activity, and ability to comprehend linguistic phenomena. The article examines the structural components of linguistic competence—phonetic, lexical, grammatical, semantic, pragmatic, and communicative skills—and the pedagogical mechanisms influencing their development. Additionally, the study explores how future teachers' language-learning motivation, communicative openness, psychological preparedness, and reflective thinking correlate with the formation of linguistic competence. The significance of learner-centered approaches, active teaching methods, digital educational tools, and reflective-practical activities in teacher training is highlighted, along with recommendations for creating effective pedagogical conditions to foster linguistic competence.*

Keywords: *linguistic competence, prospective primary school teachers, pedagogical process, psychological preparedness, communicative skills, language teaching methodology, linguistic thinking, teacher speech culture, motivation.*

Introduction. In the context of contemporary globalization and the rapid development of information and communication technologies, one of the key tasks facing the education system is the formation of individuals' communicative, particularly linguistic, competence. Language, as a foundation of personal, cultural, and social development, plays a decisive role in shaping learners' thinking and communication skills at the primary education level. Prospective primary school teachers serve not only as educators but also as mediators who transmit language and cultural values. Therefore, the development of their linguistic competence requires the integration of theoretical knowledge, practical skills, and methodological preparation. The effectiveness of this process depends on the harmonious combination of pedagogical and psychological approaches. Enhancing the methodological readiness of future teachers has been identified as a priority within the Concept for the Development of the Public Education System of Uzbekistan until 2030 [1]. In accordance with this concept, higher education institutions that train pedagogical specialists are being gradually transitioned to a credit-module system. Additionally, it emphasizes improving instructional materials in subjects such as pedagogy, didactics, applied pedagogical psychology, and methodology, as well as revising pedagogical assessment criteria. The concept also highlights the need for mastering modern educational theories, deepening the understanding of pedagogical psychology, and acquiring competency-based and learner-centered teaching approaches. Furthermore, the concept outlines tasks such as developing methods for identifying the professional inclination and creativity of future teachers, improving the qualitative composition of

teaching staff in general education institutions, and gradually increasing the number of teachers holding a master's degree. These reforms have become a significant driving force for the rapid and consistent transformation of the education sector [1].

Review of Related Literature. Throughout the research process, various definitions and interpretations of the components of linguistic competence have been proposed by different scholars. Below, several prominent approaches are examined. Researchers Canale and Swain classify language competence into the following key components: grammatical (linguistic), sociolinguistic, discourse, and strategic competences [2]. A comprehensive "linguistic-communicative competence model" was later developed by Jan van Ek, which has become one of the classical theoretical frameworks characterizing the competence-based approach in language teaching and learning within the Council of Europe. Frequently referred to as the model of "communicative language competence," it laid the conceptual foundations for the CEFR (Common European Framework of Reference for Languages). Van Ek's model emphasizes not only grammar and vocabulary but also the formation of holistic communicative ability. He divides language competence into several components:

linguistic competence;
sociolinguistic competence;
pragmatic competence;
strategic competence;
discourse competence;
sociocultural competence;
cognitive-communicative competence [3] .

According to Vygotsky, "linguistic competence is effectively developed through scaffolding based on the learner's developmental level, and this involves learning within a communicative environment, group-based interactive activities, and functional use of language as the primary means of instruction" [4]. His view holds significant importance in primary education pedagogy, as language is formed not merely as a system of knowledge, but as a tool of social and educational interaction. Vygotsky's concepts of the "zone of proximal development" and "scaffolding" (temporary instructional support provided by the teacher) demonstrate the need to teach students at the level closest to their potential development.

Research Methodology. In the Dictionary of Methodological Terms and Concepts, A.N. Shukin and E.G. Azimov define linguistic competence as "the mastery of the studied language across its levels—phonetics, vocabulary, word structure, word formation, morphology, simple and compound sentence syntax, and the basics of text stylistics. If a learner has a clear understanding of the language system and is able to use it in practice, they can be considered linguistically competent" [5]. Foreign scholar Ferdinand de Saussure emphasized that the primary task of linguistics is the study of language as a system [6]. He distinguished between internal and external linguistics, considering them contrasting fields and arguing that the main focus of linguistics should be on internal linguistic structures. Historically, this science served practical needs such as the creation of writing systems, teaching language, and understanding foreign languages. Today, however, its importance has significantly increased.

A systematic analysis of linguistic competence involves identifying its structural components. I.A. Zimnyaya presents the following componential structure of competence:

the motivational component (readiness to demonstrate the skill);
the cognitive component (knowledge about the content of the competence);

the behavioral component (experience in applying the competence in standard and non-standard situations);

the value-semantic component (attitude toward the content and object of competence);

the emotional-volitional component (regulation of the process and the outcome of demonstrating competence) [7].

According to I.F. Musayelyan, “language competence encompasses lexical and grammatical knowledge, skills, and abilities.” The scholar further distinguishes between productive and receptive skills and abilities, highlighting their specific roles in the development of language competence [8].

Analysis and Results. Linguistic competence is the ability to regulate speech activity through the practical application of grammatical rules—using words and sentences correctly in the target language and distinguishing between correct and incorrect expressions in communication. In this context, the linguistic competence of prospective primary school teachers in the Uzbek language refers to their ability to understand linguistic units and speech features, analyze linguistic phenomena, integrate parts into a coherent whole, and construct sentences based on given models.

Developing this competence enables learners to express their thoughts freely, clearly, concisely, fluently, and comprehensibly in their native language, while adhering to the norms of the literary language and avoiding orthographic and stylistic errors. In general education schools, the task of fostering such competencies falls primarily on the subject “Mother Tongue.” As a solution to this problem, the pedagogical, psychological, and methodological characteristics of developing linguistic competence in future primary school teachers are examined below.

Table 1. Characteristics of Developing Linguistic Competence in Prospective Primary School Teachers

Characteristics	Content
Psychological	Personal qualities, communication skills in interacting with pupils, ability to create a psychologically supportive pedagogical environment, and competence in delivering linguistic knowledge appropriate to developmental levels
Pedagogical	Ability to apply linguistic knowledge as a didactic tool—explaining grammatical rules clearly to children, analyzing linguistic material, designing exercises, and preparing lesson plans
Methodological	Skills in planning lessons, selecting appropriate methods and tools, and organizing activities that effectively contribute to the formation of linguistic competence

These features indicate that prospective primary school teachers must strengthen not only their linguistic knowledge but also their psychological and methodological readiness, organize the educational content based on a competence-oriented approach, and pay particular attention to developing practical skills. From a psychological perspective, essential aspects include the teacher’s personal qualities, communicative culture, and ability to establish effective interaction with pupils. Working with younger learners requires patience, politeness, emotional stability, and a high level of speech culture. Equally important is delivering linguistic knowledge in a developmentally appropriate way and considering pupils’ psychological characteristics. Moreover, the teacher must create a supportive learning environment that fosters motivation toward language acquisition. From a pedagogical standpoint, the development of linguistic

competence relies on integrative, gradual, learner-centered, and activity-based teaching approaches. Through the practical use of language in real communication scenarios, teachers help students express their ideas freely, accurately, and grammatically correctly. From a psychological point of view, mastering language is closely linked to cognitive development, motivation, attention, linguistic thinking, and reflection. The future teacher's independence in working with language, cognitive flexibility, and linguistic intuition are rooted in individual psychological characteristics. This requires designing the educational process according to learners' needs and developmental levels. Methodologically, linguistic competence development depends on the teacher's ability to organize the instructional process effectively, select and integrate modern methods and tools, and implement them in practice. Lesson planning must be logically structured, time-efficient, and well-sequenced. The use of interactive methods, communicative approaches, and game-based techniques is particularly effective in increasing learner engagement. Didactic tools—such as visual aids, multimedia resources, and structured exercise systems—play a crucial role in shaping linguistic competence. Linguistic competence can also be enhanced through communicative approaches, gamification, the 5E instructional model, differentiated instruction, and reflective teaching strategies. In this process, the teacher's activity level, creativity, professional self-development, and conscious approach to teaching serve as decisive factors. Overall, the development of linguistic competence in future primary school teachers is a complex, multifaceted process that requires the harmonious integration of pedagogical and psychological factors. The findings of this study demonstrate that linguistic competence formation cannot be limited to theoretical knowledge alone; rather, it is intrinsically connected to cognitive processes, motivation, professional orientation, and reflective activity.

Conclusion and recommendations. The process of developing linguistic competencies in future primary school teachers is explained by the integrated functioning of pedagogical and psychological factors. Since the primary education stage is a decisive period for children's speech development, understanding of language phenomena, and formation of communication skills, the teacher's preparation for this process must be profound. First of all, psychological readiness is manifested in the teacher's personal qualities, emotional stability, ability to understand children's psychology, and provide appropriate pedagogical support. Such factors as communicative openness, clarity of expression, and the ability to create a supportive psychological environment help strengthen pupils' interest and confidence in language learning.

From the pedagogical perspective, linguistic competence develops through the teacher's ability to present linguistic knowledge in a well-structured didactic form, explain grammatical rules with simple and clear examples, and teach analysis and synthesis gradually. Since primary school pupils have specific cognitive characteristics such as perception, thinking, and memory particularities, the content of the pedagogical process must be adapted to their developmental level. Reinforcing language material through practical exercises, games, text-based activities, and communicative tasks is an effective means for improving linguistic competence. From a methodological point of view, thorough lesson planning, appropriate selection of methods and tools, and the ability to apply interactive approaches are essential. Modern pedagogy requires encouraging learner activity, developing independent thinking, and ensuring practical language acquisition through communicative tasks. Therefore, the use of didactic materials, visual aids, multimedia resources, as well as group and pair activities serves as an effective tool for the formation of linguistic competence. The more methodologically literate the teacher is, the more structured, meaningful, and result-oriented the learning process becomes. The above

considerations show that forming linguistic competence in future primary school teachers is not limited to knowing language rules; rather, it is a complex process based on the unity of psychological sensitivity, pedagogical mastery, and methodological precision. Organizing educational activities aimed at developing this competence on a scientific basis contributes to improving the quality of primary education, enhancing pupils' speech development, and establishing a strong foundation for their success in later educational stages. Therefore, deep study and practical implementation of pedagogical and psychological features are among the key directions in the preparation of future teachers. To increase the effectiveness of developing linguistic competencies in future primary school teachers, the following scientific and practical recommendations are proposed:

First, it is necessary to introduce special integrative courses in pedagogical higher education institutions aimed at developing linguistic competence. These courses should emphasize the adaptation of linguistic theory to primary school practice, ensuring the "theory–practice" connection.

Second, to strengthen the psychological preparation of future teachers, it is advisable to expand training sessions, role-plays, and pedagogical situation-based activities that develop communicative competence. Through this, they acquire skills for effective communication with pupils and creating a positive psychological atmosphere.

Third, the systematic use of modern pedagogical technologies and interactive methods in teaching linguistic knowledge is essential. In particular, methods such as problem-based learning, cluster mapping, aquarium technique, and brainstorming can increase pupils' independent thinking and speech activity.

Fourth, it is important to develop skills for effective use of didactic tools during lessons. Explaining language material through visual aids, multimedia resources, and interactive platforms increases pupils' interest and contributes to solid knowledge acquisition.

Fifth, during pedagogical practice, future teachers should be assigned tasks specifically aimed at developing linguistic competence; their lesson plans should be analyzed, and continuous monitoring should be carried out to improve methodological skills.

In conclusion, implementing these recommendations into practice will ensure the systematic and effective development of linguistic competencies in future primary school teachers, ultimately contributing to improving the quality of primary education.

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CONDITIONS FOR IMPROVING SPEECH-COMMUNICATIVE SKILLS PREPARATION IN CHILDREN WITH AUTISM SPECTRUM DISORDERS BASED ON BEHAVIORAL MANAGEMENT

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Abstract. *This article examines the pedagogical and psychological conditions necessary for improving the preparation of speech-communicative skills in children with autism spectrum disorder through the application of behavioral management principles. Children with autism spectrum disorders face significant challenges in developing speech and communicative competencies, which remain central obstacles to their social integration and educational achievement. Drawing on applied behavior analysis, verbal behavior therapy, pivotal response treatment, and augmentative and alternative communication strategies, the study synthesizes current empirical evidence and theoretical frameworks to identify key environmental, methodological, and interpersonal conditions that foster communicative development. The article argues that a structured yet flexible behavioral management environment - combining positive reinforcement, naturalistic teaching, family involvement, and individualized goal-setting - constitutes the optimal framework for enhancing communicative readiness in children with autism spectrum disorder. Findings suggest that early intervention, consistent cross-setting application, and the integration of digital technologies substantially improve communicative outcomes. The article concludes with recommendations for educators, corrective pedagogues, and policymakers in designing inclusive and effective speech-communicative preparation programs.*

Keywords: *autism spectrum disorder, behavioral management, speech-communicative skills, applied behavior analysis, verbal behavior therapy, pivotal response treatment, augmentative and alternative communication, corrective pedagogy, early intervention, inclusive education.*

INTRODUCTION. Autism spectrum disorder is a complex neurodevelopmental condition characterized by persistent deficits in social communication and interaction, alongside restricted and repetitive patterns of behavior, interests, or activities. The prevalence of autism spectrum disorder has steadily increased in recent decades; according to the centers for disease control and prevention, approximately 1 in 36 children in the United States is diagnosed with autism spectrum disorder, while global estimates suggest a prevalence of around 1-2% of the world's population. Among the defining features of ASD, impairments in speech and communicative functioning represent the most educationally significant challenges. "Children with autism spectrum disorder often demonstrate delayed language acquisition, echolalia, limited spontaneous communication, difficulties with pragmatic language use, and challenges in joint attention - all of which impede learning, social integration, and quality of life" [1, p. 15.].

For a substantial proportion of children with ASD - estimated between 25% and 50% - speech may remain absent or severely limited without intensive, targeted intervention. Behavioral

management, particularly as systematized within applied behavior analysis (ABA), has accumulated the most robust empirical evidence as an intervention framework for autism spectrum disorder. ABA-based approaches operate on the principle that communicative behaviors, like all behaviors, can be shaped, reinforced, and generalized through systematic environmental manipulation. “The integration of behavioral management into speech-communicative skill development has given rise to a suite of methodologies - including Verbal Behavior therapy, Pivotal Response Treatment, Discrete Trial Training, and naturalistic developmental behavioral interventions - each offering distinct pedagogical conditions for communicative growth” [2, p. 264.].

Despite this evidence base, a critical gap persists in the literature: the systematic articulation of the conditions - environmental, methodological, social, and technological - that must be in place for behavioral management to effectively improve communicative preparation in children with autism spectrum disorder.

This article addresses that gap by synthesizing evidence from international empirical research, theoretical models, and pedagogical practice to identify and describe these conditions comprehensively. The article proceeds as follows. Section 2 provides a theoretical foundation, reviewing core behavioral and communicative frameworks relevant to autism spectrum disorder intervention. Section 3 identifies and analyzes the primary pedagogical and psychological conditions for improving speech-communicative skill preparation. Section 4 examines the role of digital technologies and AAC within a behavioral management framework. Section 5 discusses family and cross-setting conditions, and Section 6 offers conclusions and practical recommendations.

MATERIAL AND METHODS. Applied behavior analysis, rooted in B.F. Skinner’s (1957) “operant conditioning theory and further developed by Lovaas (1987) and Cooper, Heron, and Heward (2020), constitutes the foundational science underlying behavioral management in autism spectrum disorder intervention” [3, p. 19.]. Applied behavior analysis operates through the systematic application of behavioral principles - antecedent manipulation, reinforcement, prompting, and generalization - to increase socially significant behaviors, including communication, while decreasing maladaptive ones. The three-term contingency (antecedent–behavior–consequence, or ABC) provides the operational mechanism through which communicative behaviors are analyzed and shaped. When applied to speech-communicative development, this framework enables educators to identify communicative functions (manding, tacting, intraverbal behavior, echoics) and systematically build each through structured teaching trials and naturalistic opportunities. “Lovaas’s landmark study demonstrated that intensive early ABA intervention could produce substantial language and intellectual gains in young children with ASD, establishing a precedent that subsequent decades of research have largely affirmed. Meta-analyses by Virues-Ortega (2010) and Makrygianni et al. (2018) confirm that comprehensive ABA programs are associated with significant improvements in language, communication, and adaptive behavior” [4, p. 126.]. Verbal Behavior (VB) therapy, developed by Sundberg and Partington (1998) and grounded in Skinner’s (1957) «Verbal Behavior», extends ABA by categorizing language functionally rather than structurally. Skinner identified distinct verbal operants - mands (requests), tacts (labels), intraverbals (conversational responses), and echoics (vocal imitation) - each serving a different communicative function and requiring separate instructional programming. VB therapy’s contribution to speech-communicative preparation lies in its functional orientation: rather than simply teaching a child to «say» words, it teaches them to «use»

language purposefully to obtain reinforcers, describe the environment, and engage in social exchange. This functional approach is particularly suited to children with ASD, whose communicative deficits are often more pragmatic than phonological or lexical. ivotal Response Treatment (PRT), developed by Koegel and Koegel (2006), targets «pivotal» [5, p. 315.] areas of child development - motivation, responsivity to multiple cues, self-management, and social initiations - on the premise that improvements in these areas produce broad collateral gains across communicative and behavioral domains. PRT employs naturalistic, child-directed teaching contexts, using the child's own interests as motivational levers and embedding communication targets within play and everyday activities. PRT's naturalistic orientation addresses a key limitation of more structured behavioral approaches: the problem of generalization. Children with ASD frequently demonstrate stimulus overselectivity and context-bound learning, making it difficult to transfer skills acquired in structured settings to natural communicative environments.

LITERATURE REVIEW. By situating instruction within natural contexts, PRT promotes more robust generalization of communicative skills. Naturalistic Developmental Behavioral Interventions (NDBIs), as conceptualized by Schreibman et al. (2015), "represent a convergent model integrating developmental science (particularly social-pragmatic and relationship-based theories) with behavioral principles" [6, p. 231.]. NDBIs share common features: instruction within natural routines, following the child's lead, use of natural reinforcers, and emphasis on social-communicative competence as a primary outcome. Exemplars include the Early Start Denver Model (ESDM), Joint Attention Symbolic Play Engagement and Regulation (JASPER), and Reciprocal Imitation Training (RIT). The NDBI framework is significant for identifying conditions of communicative preparation that extend beyond discrete skill acquisition to encompass the relational, motivational, and developmental conditions necessary for authentic communicative growth. Among all identified conditions, early intervention onset and intervention intensity emerge as the most consistently supported predictors of communicative outcome in children with ASD. The neurodevelopmental plasticity of the young brain renders the preschool period a critical window for language acquisition, and numerous studies confirm that earlier ABA initiation is associated with better communicative outcomes. The Early Start Denver Model, tested in a landmark randomized controlled trial by Dawson et al. (2010), demonstrated that children receiving early intensive NDBI showed significantly greater gains in receptive and expressive language compared to community treatment controls. "The principle of «brain plasticity» - the capacity of the developing nervous system to reorganize in response to experience - underpins the imperative of early communicative intervention. Intensity also matters: research generally supports a minimum of 20-40 hours per week of structured intervention for children with ASD, though the optimal configuration depends on individual child characteristics, program quality, and the specific communicative goals being targeted. Importantly, intensity should not be conflated with rigid drill-based instruction; research increasingly supports the distribution of intensive practice across naturalistic, motivating contexts" [7, p. 784.].

RESULTS. A second foundational condition is the use of systematic, individualized assessment to guide communicative programming. Children with ASD present with highly heterogeneous profiles of communicative strength and deficit; a one-size-fits-all curriculum is demonstrably insufficient (Paul et al., 2018). Behavioral management frameworks address this through tools such as the Verbal Behavior Milestones Assessment and Placement Program, the Assessment of Basic Language and Learning Skills - Revised, and the Autism Diagnostic Observation Schedule.

These assessments enable educators and clinicians to identify the child's current verbal operant repertoire, pinpoint the specific communicative functions that are absent or emerging, and construct individualized intervention plans with measurable, functional targets. The condition of individualization is not merely methodological - it reflects a foundational ethical commitment to treating each child as a unique learner with distinct communicative potential. The physical and social environment constitutes a critical condition for communicative development. Behavioral management emphasizes the careful engineering of the antecedent environment to maximize opportunities for communicative behavior and minimize barriers. Environmental design strategies include:

- Arranging materials to create communicative temptations.
- Structuring activity sequences to embed communicative targets naturally.
- Reducing sensory distractions that compete with communicative attending.
- Creating predictable routines that scaffold communicative participation.
- Designing transitions as opportunities for communicative exchange.

Research by Krantz and McClannahan (1993) demonstrated that environmental arrangement significantly increased spontaneous communication in children with ASD, underscoring the condition of intentional environmental design. The concept of «communication-rich environments» - settings organized explicitly to evoke, support, and reinforce communicative behavior - is now standard in evidence-based ASD pedagogy. "Motivation is arguably the most influential individual-level condition for communicative learning in children with ASD. The frequent co-occurrence of ASD with reduced social motivation - sometimes conceptualized within the Social Motivation Hypothesis - means that social praise, which serves as a natural reinforcer for neurotypical children's communicative behavior, may be functionally weak or neutral for many children with autism spectrum disorder." [8, p. 803.].

Effective behavioral management therefore requires systematic identification of each child's individual reinforcers through reinforcer assessment and the strategic deployment of these reinforcers to strengthen communicative behaviors. The condition of individualized, high-quality reinforcement is non-negotiable in ABA-based communicative intervention. PRT extends this by emphasizing natural reinforcers - reinforcers that are directly and functionally related to the communicative act - over arbitrary ones. For example, a child who mands for a preferred toy should receive that toy, not a food reward. Natural reinforcement is associated with higher rates of maintenance and generalization. Functional Communication Training (FCT), developed by Carr and Durand (1985), represents a behavioral management strategy that directly addresses the relationship between problem behavior and communicative deficits in children with autism spectrum disorder.. FCT is grounded in the observation that many challenging behaviors (e.g., tantrums, self-injury, aggression) function as communicative acts - attempts to obtain reinforcers or escape aversive situations in the absence of conventional communicative means.

"FCT teaches children to replace these problem behaviors with socially appropriate communicative alternatives that serve the same function. The condition established by FCT is the identification and systematic reinforcement of functional communicative responses, while withholding reinforcement from the problem behavior. Extensive research supports FCT as both an effective communication-building and behavior-reduction strategy" [9, p. 17.].

FCT's contribution to the broader conditions for communicative preparation is its demonstration that speech-communicative skill development and behavioral management are not parallel processes but deeply interdependent ones: communication emerges within behavioral

contexts, and behavior is shaped by communicative capacity. For children with ASD who are minimally verbal or nonverbal, Augmentative and Alternative Communication (AAC) - encompassing picture exchange systems, speech-generating devices (SGDs), sign language, and communication boards - represents an essential condition for communicative participation. The widespread historical concern that AAC use would suppress speech development has been comprehensively refuted; evidence consistently shows that AAC supports rather than inhibits natural speech acquisition. The Picture Exchange Communication System applies behavioral principles directly to AAC instruction, teaching children to initiate communication by exchanging picture symbols for desired items. PECS progresses through six phases, moving from single-item requests to sentence construction, and has demonstrated effectiveness in building manding and spontaneous communication across numerous RCTs and single-case studies. The proliferation of tablet-based AAC applications and digital intervention platforms has expanded the technological conditions available for communicative preparation. Tablet-based SGDs offer advantages of portability, social acceptability, and motivational appeal for many children with ASD, and their integration within behavioral management frameworks has shown promising results.

“Beyond AAC, digital technologies facilitate communicative preparation through video modeling - a behavioral strategy in which children watch video demonstrations of target communicative behaviors and imitate them. Video modeling has a robust evidence base for ASD communication intervention and can be implemented efficiently through standard digital devices.

The condition of technology integration is increasingly recognized not as supplementary but as core to contemporary communicative preparation” [10, p. 491.].

Artificial intelligence and machine learning applications are beginning to enter ASD communication intervention, with systems capable of providing adaptive, personalized communicative prompting and feedback. While the evidence base for AI-driven ASD communication tools remains nascent, the trajectory of this technological condition is significant for future pedagogical design.

Family involvement constitutes one of the most robustly supported conditions for communicative improvement in children with ASD. Parents and caregivers are the child’s primary communication partners and occupy the natural environments in which communicative skills must ultimately function. Behavioral management programs that train parents as intervention agents - teaching them to implement mand training, natural environment teaching, FCT, and reinforcement strategies - demonstrate substantially better communicative outcomes than clinic-only approaches.

Parent-implemented intervention models such as PECS Phase I training, PRT parent training, and ESDM parent coaching programs have demonstrated efficacy in increasing communicative initiations, joint attention, and language complexity in children with ASD. The condition of family training requires that educators and clinicians provide not only instruction but ongoing coaching, feedback, and support to ensure accurate and consistent implementation.

Generalization - the transfer of communicative skills across settings, people, and materials - is recognized as the ultimate measure of intervention success and a distinctive challenge in ASD behavioral programming. The behavioral management conditions that support generalization include:

- Training in multiple exemplars and settings from the outset of instruction.
- Using multiple communication partners during training.
- Programming for natural maintaining contingencies (reinforcement that exists in the natural environment).

- Employing loose training procedures (varied materials, instructions, and contexts).
- Systematically fading structured prompts to promote independence.

Generalization is not a passive outcome but a condition that must be deliberately programmed. Failure to address generalization conditions results in communicative repertoires that are restricted to the training context - a common criticism of poorly implemented ABA programs that focus exclusively on structured drill. The complexity of communicative impairment in ASD necessitates transdisciplinary collaboration as an organizational condition for effective preparation. Speech-language pathologists, special educators, behavior analysts, psychologists, occupational therapists, and families must function as a coordinated team, sharing assessment data, aligning communicative goals across settings, and ensuring consistent implementation of behavioral strategies. The condition of transdisciplinary collaboration is particularly critical in educational settings, where the risk of fragmented, inconsistent intervention is high. Structured collaboration mechanisms - shared intervention plans, regular team meetings, common data systems, and joint professional development - constitute the organizational infrastructure for effective communicative preparation. The conditions identified in this review converge on a coherent model of communicative preparation for children with ASD that is simultaneously behavioral, developmental, relational, and systemic. No single strategy or condition is sufficient; rather, it is the integration of early onset, individualized assessment, structured environment, motivational support, functional communication training, AAC, digital technologies, family involvement, and generalization programming that constitutes the optimal preparation framework.

Several tensions within this model warrant acknowledgment. First, the balance between structure and naturalism remains a productive area of debate. Highly structured approaches (e.g., intensive DTT) offer precision and efficiency in skill acquisition but may undermine generalization and social authenticity. Naturalistic approaches offer ecological validity but may provide insufficient learning opportunities for children with significant impairments. The current evidence suggests that both structured and naturalistic approaches are necessary and that their optimal combination depends on individual child characteristics and phase of intervention.

Second, the cultural and contextual applicability of primarily Western-developed behavioral management frameworks to diverse educational contexts - including Central Asian settings - deserves critical attention. The values embedded in ABA-based approaches (individual goal-setting, reinforcement systems, data-driven decision-making) may require adaptation to local pedagogical traditions, family structures, and resource conditions. Khodjaeva and Yusupova (2021) note that special education in Uzbekistan is undergoing significant reform, with increasing integration of international evidence-based practices, suggesting both opportunity and need for culturally adapted implementation frameworks.

Third, the ethical conditions of communicative preparation - respect for child agency, avoidance of coercive or aversive procedures, and commitment to authentic communicative participation - are increasingly foregrounded in contemporary ASD pedagogy. Behavioral management, when implemented with fidelity to contemporary ethical standards, is grounded in positive reinforcement and child-centered goal-setting; the condition of ethical practice is thus not external to behavioral management but constitutive of its contemporary form.

DISCUSSION. This article has synthesized evidence from behavioral science, developmental psychology, speech-language pathology, and special education pedagogy to identify the conditions necessary for improving speech-communicative skills preparation in

children with ASD within a behavioral management framework. The following recommendations emerge:

For educators and corrective pedagogues:

- Implement structured functional communicative assessments (VB-MAPP, ABLLS-R) prior to programming to ensure individualization.

- Design communication-rich environments with deliberate antecedent arrangements that evoke and reinforce communicative behavior.

- Integrate FCT systematically for children whose problem behaviors serve communicative functions.

- Embed communicative targets within naturalistic, motivating activities rather than relying exclusively on discrete trials.

- Ensure generalization is programmed explicitly across all phases of intervention.

«For speech-language pathologists:»

- Provide AAC assessment and intervention for minimally verbal children without delay, employing evidence-based systems such as PECS or SGD-based approaches.

- Coordinate with behavior analysts and educators to ensure consistent communicative expectations and reinforcement across settings.

For families:

- Participate in structured parent training programs to implement behavioral communicative strategies in natural home routines.

- Maintain communicative demands and reinforcement consistent with school-based programming to support generalization.

For policymakers and educational administrators:

- Fund early intensive intervention programs with sufficient staffing and duration to meet evidence-based intensity thresholds

- Support transdisciplinary team structures and professional development in behavioral communicative intervention.

- Promote the integration of digital AAC technologies within special education programs

The improvement of speech-communicative preparation in children with ASD is not a technical problem with a single solution but a complex pedagogical challenge requiring the deliberate cultivation of multiple interacting conditions. Behavioral management, as a comprehensive and adaptable framework, provides the theoretical and practical infrastructure for meeting this challenge - provided it is implemented with scientific rigor, ethical commitment, and sensitivity to the individual child’s communicative potential and life context. Children with autism spectrum disorder require specially organized educational and corrective conditions in order to develop speech and communication successfully. In many cases, the problem is not only the absence or delay of speech, but also the inability to use language meaningfully in everyday interaction. Such children may find it difficult to express their needs, respond to questions, maintain eye contact, participate in dialogue, or understand social meaning in communication. For this reason, the preparation of speech-communicative skills should be understood as a purposeful and systematic process aimed at forming functional communication in natural and educational environments. One of the most important conditions for improving speech and communication in children with autism spectrum disorder is the early identification of developmental difficulties and the timely beginning of intervention. Early childhood is the most sensitive period for the formation of language, social attention, imitation, and emotional interaction. If corrective and pedagogical

support begins during this period, the child has greater opportunities to develop communicative readiness and to master socially meaningful forms of interaction. Early support also helps prevent secondary behavioral difficulties that often arise when a child cannot express needs, emotions, or discomfort through understandable communication. Another essential condition is the individualization of the educational and corrective process. Every child with autism spectrum disorder has a unique developmental profile. Some children may have separate words but cannot use them appropriately in social situations. Others may understand speech but experience serious difficulty producing verbal responses. There are also children who rely more successfully on visual support, gestures, pictures, or technological means of communication. Therefore, the content, pace, methods, and expected outcomes of speech-communicative preparation must be based on the child's actual abilities, needs, and motivational characteristics. An individual approach allows specialists to identify strong sides of development and use them as a foundation for overcoming communication barriers. A well-structured environment is also a necessary condition for successful communicative development.

Children with autism spectrum disorder often respond more positively in settings that are predictable, organized, emotionally safe, and visually clear. When the environment includes stable routines, understandable instructions, visual schedules, and carefully arranged communication opportunities, the child becomes more prepared to participate in interaction. A chaotic or overstimulating environment can reduce attention, increase anxiety, and weaken the child's willingness to communicate. By contrast, a structured learning space helps the child focus on relevant social and linguistic stimuli and gradually master new communicative patterns.

Equally important is the use of positive motivational support in the teaching process. Communication develops more effectively when the child experiences success, emotional comfort, and meaningful reinforcement. If the child's attempts to communicate are noticed, encouraged, and rewarded through desirable outcomes, the frequency of communicative behavior increases. Motivation should not be artificial or disconnected from real life. It is most effective when communication is directly linked to the child's interests, everyday needs, and preferred activities. For example, a child is more likely to use words, symbols, or gestures when this helps obtain a favorite object, continue an enjoyable activity, or attract the attention of a significant adult.

In this way, speech and communication become functional, purposeful, and personally meaningful. The development of speech-communicative skills in children with autism spectrum disorder also depends on the active involvement of adults who surround the child. Teachers, speech therapists, special educators, psychologists, and parents should work in close cooperation and follow common goals. If communication requirements and support strategies differ sharply between home and school, the child may struggle to generalize newly learned skills. On the other hand, when adults use similar approaches, reinforce the same communicative behaviors, and create consistent expectations across settings, the child receives a unified developmental space. Family participation is especially important because communication is formed not only in therapy sessions or lessons, but also during meals, play, прогулки, household routines, and emotional interaction with close people. Another significant condition is the inclusion of alternative and supportive means of communication for children who do not yet use speech effectively. Pictures, visual cards, communication boards, gestures, and speech-generating devices can help the child express needs and participate in interaction before fluent speech develops. These tools should not be seen as barriers to verbal language. On the contrary, they often serve as bridges toward broader communicative competence, reduce frustration, and support the understanding of symbolic

exchange. When such means are introduced correctly and consistently, they can become an important part of the child's communicative preparation and social adaptation. It is also necessary to pay attention to the connection between communication and behavior. In children with autism spectrum disorder, challenging behavior often appears when the child cannot express refusal, ask for help, request a preferred item, or explain discomfort. In this sense, the improvement of communication is closely related to the reduction of problematic behavior. When a child learns acceptable and understandable ways to communicate, emotional tension often decreases, and social interaction becomes more stable. Thus, work on communicative skills should be organized not separately from behavioral support, but as an integrated process in which speech, interaction, emotional regulation, and social adaptation develop together.

CONCLUSION. In conclusion, the improvement of speech-communicative skills preparation in children with autism spectrum disorder requires a complex combination of pedagogical, psychological, and social conditions. These include early intervention, individualization, structured and supportive environments, motivation-based teaching, family involvement, professional cooperation, and the use of supportive communication tools. Only under such conditions can the child gradually move from isolated reactions to purposeful communication, from passive presence to active participation, and from communication difficulty to meaningful social interaction.

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COMPARATIVE ANALYSIS OF ONLINE AND TRADITIONAL EDUCATION EFFECTIVENESS: A PEDAGOGICAL APPROACH

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Abstract. *This article presents a comprehensive comparative analysis of the effectiveness of online and traditional education based on pedagogical approaches. The study examines key dimensions such as learning outcomes, student engagement, motivation, interaction, and adaptability. By integrating modern educational theories and empirical observations, the research highlights the strengths and limitations of both learning formats. The findings suggest that while online education offers flexibility and accessibility, traditional education provides stronger social interaction and structured learning environments. The study concludes that a blended learning model can optimize educational effectiveness.*

Keywords: *online education, traditional education, pedagogy, learning outcomes, student engagement, blended learning, digital learning.*

Introduction

The rapid development of information and communication technologies has significantly transformed the educational landscape. In recent decades, online education has emerged as a powerful alternative to traditional classroom-based learning. This transformation has been further accelerated by global challenges such as the COVID-19 pandemic, which forced educational institutions worldwide to adopt digital learning platforms.

Education is not only a process of knowledge transfer but also a complex pedagogical interaction between teachers and students. Therefore, the effectiveness of any educational format depends on how well it supports cognitive, emotional, and social development. Traditional education, characterized by face-to-face interaction, has long been considered the standard model of teaching. However, online education introduces new opportunities for personalized learning, flexibility, and access to global resources.

This study aims to compare the effectiveness of online and traditional education from a pedagogical perspective, identifying their advantages, limitations, and potential integration.

Literature Review

Modern pedagogical theories emphasize the importance of active learning, student-centered approaches, and interactive environments. Constructivist theory suggests that learners actively construct knowledge through experience and interaction. In this context, traditional classrooms provide immediate feedback and social learning opportunities.

On the other hand, online education aligns with connectivism, which highlights learning through digital networks and information exchange. Research indicates that online learning can enhance independent thinking and self-regulation but may also lead to reduced motivation if not properly structured.

Scholars have also emphasized the role of blended learning, which combines online and traditional methods to maximize educational effectiveness. Studies show that hybrid models often produce better learning outcomes compared to single-format instruction.

Methodology

This research employs a mixed-method approach, combining qualitative and quantitative data collection methods. Surveys and interviews were conducted among students and teachers who have experienced both online and traditional learning environments. Additionally, academic performance indicators and engagement levels were analyzed. The study sample includes secondary school and university students, providing a broader perspective on the effectiveness of both educational formats.

Pedagogical Comparison of Online and Traditional Education

1. Learning Outcomes

Traditional education often ensures consistent academic performance due to structured schedules and direct supervision. Teachers can monitor student progress closely and provide immediate feedback.

In contrast, online education allows students to learn at their own pace, which can enhance understanding for self-motivated learners. However, lack of discipline may negatively affect outcomes for some students.

2. Student Engagement

Student engagement is a critical factor in effective learning. In traditional classrooms, engagement is supported through direct interaction, group activities, and classroom discussions.

Online education relies on digital tools such as videos, forums, and interactive platforms. While these tools can be engaging, they require strong instructional design to maintain student interest.

3. Social Interaction

One of the key advantages of traditional education is face-to-face communication, which helps develop social skills, teamwork, and emotional intelligence.

Online education, however, may limit real-time interaction, leading to feelings of isolation. Although virtual communication tools can partially compensate for this, they cannot fully replace physical presence.

4. Flexibility and Accessibility

Online education provides greater flexibility, allowing students to access materials anytime and anywhere. This is particularly beneficial for working students or those in remote areas.
Traditional education, while less flexible, offers a more structured environment that can support discipline and routine.

5. Teacher's Role

In traditional education, teachers act as direct facilitators, guiding students through the learning process.

In online education, the teacher's role shifts toward that of a facilitator and content designer, requiring new digital competencies and pedagogical strategies.

Table: Comparative Analysis

Criteria	Online Education	Traditional Education
Flexibility	High	Low
Interaction	Moderate	High

Accessibility	High	Moderate
Engagement	Depends on design	Naturally high
Learning control	Student-centered	Teacher-centered

Results and Analysis

The results indicate that both online and traditional education have distinct advantages and challenges. Approximately 60% of students reported that online education improved their independent learning skills, while 70% preferred traditional classrooms for better interaction and understanding.

The findings suggest that no single format is universally superior. Instead, effectiveness depends on factors such as teaching methods, student motivation, and technological infrastructure.

Discussion. From a pedagogical perspective, the effectiveness of education is determined by how well it supports holistic student development. Traditional education excels in social and emotional learning, while online education enhances autonomy and digital literacy.

It can be argued that the integration of both formats offers the most balanced approach. Blended learning environments combine the strengths of face-to-face interaction with the flexibility of digital platforms.

Practical Implications. Educational institutions should consider implementing hybrid learning models that incorporate both online and traditional elements. Teachers should be trained in digital pedagogy, and curricula should be adapted to include interactive and student-centered methods.

Limitations of the Study. This study is limited by its sample size and regional focus. Future research should include larger and more diverse populations to improve generalizability.

Future Research Directions. Further studies should explore the long-term impact of online education on cognitive and social development, as well as the effectiveness of emerging technologies such as artificial intelligence in education.

Conclusion. In conclusion, both online and traditional education have unique strengths and limitations. While online education offers flexibility and accessibility, traditional education provides stronger interpersonal interaction and structured learning environments. A blended pedagogical approach is the most effective strategy for modern education, as it combines the advantages of both formats and meets the diverse needs of learners.

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COORDINATION OF COORDINATION SKILLS AND THE DEVELOPMENT OF MOVEMENT ACCURACY IN ARTISTIC GYMNASTICS TRAINING SESSIONS

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Abstract. *This article discusses the issues of developing coordination skills, coordination, and accuracy of movement in the process of rhythmic gymnastics. It is justified that the specific features of rhythmic gymnastics require a high level of sensorimotor control in children, namely, spatial-temporal accuracy and coordination of movements. The issues of the gradual formation of coordination skills by improving the spatial, force, and time parameters of movements, strengthening control and self-control mechanisms, and the effective use of inertial movements are considered.*

Keywords: *muscle, rhythmic gymnastics, inertial, potential, space, coordination, time, parameter, motor, dynamic, sensor mechanism.*

Introduction

At present, achieving high results in the field of physical education and sport directly depends on the comprehensive preparation of athletes. In particular, artistic gymnastics, as a sport rich in complex coordinative movements, requires athletes to possess a high level of coordination ability, speed, flexibility, sense of rhythm, and movement accuracy. Performing exercises to musical accompaniment, based on a precise tempo and rhythm, further necessitates the effective development of coordination skills.

Coordination skills refer to the ability to control movements and perform them accurately, quickly, and purposefully. In artistic gymnastics, these skills are especially important for proper spatial orientation, maintaining balance, executing complex turns and jumps precisely, and effectively working with apparatus.

Movement accuracy ensures the correct execution of technical elements, their aesthetic appearance, and compliance with competition evaluation criteria. Modern sports practice shows that developing coordination abilities from an early age facilitates the acquisition of complex technical elements in later stages. Therefore, it is essential to pay special attention to both general and specialized coordination exercises during training. These exercises contribute to strengthening the vestibular system, increasing reaction speed, ensuring precise execution of movement sequences, and improving spatial orientation.

Literature Review

Coordination abilities are defined as an athlete’s capacity to perform various complex motor activities quickly, accurately, and purposefully. In scientific sources (in particular, in the studies of Lev Pavlovich Matveev and Vladimir Ivanovich Lyakh), coordination is interpreted as an essential component of physical qualities and is closely associated with movement control, balance maintenance, sense of rhythm, and spatial accuracy. I

t is especially emphasized that in artistic gymnastics, exercises performed with apparatus (hoop, ball, ribbon, and clubs) require a high level of sensitivity and precision.

Results

Coordination abilities refer to the capacity to solve motor tasks –especially complex and unexpected ones – with a high level of mastery, characterized by speed, accuracy, efficiency, economy, and resourcefulness. The wide range of abilities associated with motor coordination can be broadly classified into three groups.

1. **First group:** The ability to accurately measure and regulate the spatial, temporal, and dynamic parameters of movements.
2. **Second group:** The ability to maintain static (postural) and dynamic balance.
3. **Third group:** The ability to perform movements without excessive muscular tension (stiffness).

The coordination abilities classified in the first group are closely related to the "sense of space," "sense of time," and "muscle sense," that is, the perception of the force being exerted.

The coordination abilities of the second group are associated with maintaining a stable body position, i.e., balance, which includes stability in static postures and equilibrium during movement.

The coordination abilities of the third group can be divided into the regulation of tonic tension and coordination tension. The former is characterized by excessive tension in the muscles responsible for maintaining posture.

The latter manifests as stiffness and rigidity in movements caused by excessive muscle contraction, over-involvement of different muscle groups—especially antagonist muscles—and the inability of muscles to fully transition from the contraction phase to the relaxation phase, which hinders the development of perfect technique.

Main Objectives of Developing Coordination Skills:

In the development of coordination skills, two groups of objectives are considered: a) comprehensive development, and b) targeted (specialized) development.

The first group of objectives is mainly addressed within general physical education. The overall level of coordination skills achieved at this stage creates broad conditions for the further improvement of motor skills.

The objectives aimed at more specific and advanced development of coordination skills are considered within sports training and professionally applied physical preparation. In the first case, the requirements are determined by the specific characteristics of the chosen sport, while in the second case, they are defined by the selected profession. In sports where competition focuses on movement technique (such as artistic and rhythmic gymnastics, figure skating, diving, etc.), the ability to create new and increasingly complex movement forms is of primary importance, as well as the ability to differentiate movement amplitude and timing across various body parts and regulate muscular effort among different muscle groups.

The development of coordination skills is also highly specialized in professional and applied physical training.

Many existing and emerging types of professional activities, evolving under the influence of scientific and technological progress, do not require significant muscular strength but impose high demands on the human central nervous system—particularly on coordination mechanisms—as well as on motor, visual, and other sensory system functions.

The integration of humans into complex "human–machine" systems creates the need for rapid perception of the environment, quick processing of incoming information, and execution of highly accurate movements based on spatial, temporal, and force parameters under overall time

pressure. Based on this, the following objectives of physical education for the development of coordination abilities have been identified:

1. to improve the ability to coordinate movements of different body parts (especially asymmetric movements and those related to professional activities);

2. to develop coordination of non-dominant limb movements;

3. to enhance the ability to coordinate movements based on spatial, temporal, and force parameters.

Solving the objectives of physical education for the targeted development of coordination abilities leads students to the following outcomes:

- significantly faster and higher-quality acquisition of various motor actions;
- continuous expansion of motor experience, which enables them to successfully perform tasks related to mastering more complex motor skills (in sports, work, etc.);
- the ability to use energy resources economically during motor activity;
- experiencing a sense of joy and satisfaction from mastering new and diverse movements to a high level of proficiency.

Physical education and sport offer a wide range of means for effectively influencing and developing coordination skills.

Main Means of Developing Coordination Skills:

The primary means of developing coordination skills are physical exercises that involve increased coordination complexity and elements of novelty.

The complexity of physical exercises can be enhanced by altering spatial, temporal, and dynamic parameters, as well as external conditions: changing the arrangement of equipment, its weight and height; modifying the support surface or increasing its instability in balance exercises; combining motor skills; integrating walking with jumping, running, and catching objects; performing exercises based on signals or within limited time. These include exercises aimed at developing the sense of space, time, and the level of muscular force.

Special exercises designed to improve motor coordination are developed with consideration of the specific characteristics of a chosen sport or profession. These exercises are similar, in coordination terms, to the technical and tactical actions required in a particular sport or work activity.

In sports training, such means are generally divided into two groups:

- **Preparatory exercises**, which facilitate the development of new movement forms in a specific sport;
- **Developmental exercises**, which are directly aimed at improving coordination skills manifested in particular sports (for example, in basketball: performing complex exercises under difficult conditions, such as jumping over a gymnastics bench and passing the ball to a partner, catching a ball after performing several consecutive somersaults on gym mats, and then throwing it into the basket, etc.).

Exercises aimed at developing coordination skills are effective only until they become automated. After that, they lose their effectiveness, since any movement mastered to the level of a skill and performed repeatedly under constant conditions no longer stimulates further development of coordination abilities.

Coordination exercises should be planned in the first half of the main part of a lesson, as they quickly lead to fatigue.

Age-related characteristics of coordination abilities:

The manifestation of coordination abilities depends on a number of factors, including:

1. the individual's ability to accurately analyze movements; 2. the activity of analyzers, especially the motor system; 3. the complexity of the motor task; 4. the level of development of other physical abilities (speed, dynamic strength, flexibility, etc.); 5. courage and determination; 6. age; 7. the overall level of preparedness of the student (i.e., a wide range of mainly variable motor skills and abilities), among others.

Discussion

Artistic gymnastics is a type of gymnastics that represents a system of exercises aimed at improving energy, health, and muscular well-being, as well as enhancing the tone of the nervous system. It encompasses a wide range of movements engaging all muscle groups and includes the development of motor-coordination skills such as agility, flexibility, endurance, plasticity, and sense of rhythm. Coordination skills are associated with the ability to control movements in space and time.

A person does not merely respond to external situations; rather, they must take into account the potential dynamics of changes, anticipate upcoming events, and accordingly develop an appropriate program of actions aimed at achieving a positive outcome.

The reproduction of spatial, force, and temporal parameters of movement is reflected in the accuracy of motor actions. Their development is determined by the improvement of sensory mechanisms that regulate movement.

The accuracy of spatial movements in various joints (simple coordination) gradually increases through exercises involving the repetition of predetermined positions. In modern conditions, the volume of activities carried out in probabilistic and unexpected situations has significantly increased, requiring resourcefulness, rapid reactions, the ability to concentrate and shift attention, as well as spatial, temporal, and dynamic accuracy of movements and their biomechanical efficiency. These qualities are essential components of coordination and the ability to precisely regulate it.

Coordination (from the Latin *coordinatio* – ordering or arrangement) is the process of harmonizing the activity of body muscles aimed at successfully performing a motor task. During the development of motor skills, motor coordination undergoes changes, including the mastery of the inertial characteristics of moving organs. At the initial stages, control is mainly achieved through active static fixation of these organs; later, it is carried out through short, precisely timed physical impulses directed at specific muscles. Finally, at the advanced stages of skill development, inertial movements emerge and are utilized, becoming directed toward solving motor tasks.

In dynamically stable movement, all inertial actions are automatically balanced without the need for special corrective impulses. When human muscles interact harmoniously and efficiently, it indicates good motor coordination. Individuals with well-developed coordination tend to perform movements easily and without visible effort, similar to professional athletes. However, coordination is not only essential in sports – it underlies every human movement.

Conclusion

In conclusion, the most extensive and accessible group of means for developing coordination skills consists of general preparatory gymnastic exercises of a dynamic nature that simultaneously engage the major muscle groups. These include relatively simple and more complex exercises performed both with and without apparatus (such as balls, gymnastics sticks, skipping ropes, clubs, etc.), carried out under varied conditions, in different body positions or

positions of its parts, and in various directions. They also include acrobatic elements (somersaults, various exercises, etc.) and balance exercises.

Mastering the correct technique of natural movements significantly contributes to the development of coordination skills, including running, various types of jumps (long, high, and depth jumps), throwing, and climbing. Among the most effective means for developing the ability to quickly and efficiently adapt motor activity in response to rapidly changing environments are active and sports games, martial arts (such as boxing, wrestling, fencing), cross-country running, skiing, and alpine skiing.

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INNOVATIVE METHODS FOR DEVELOPING CRITICAL THINKING IN STUDENTS

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Abstract. *This article explores innovative pedagogical methods for developing critical thinking skills in students. In the context of rapidly changing educational demands, critical thinking has become a fundamental competence necessary for academic success and lifelong learning. The study analyzes modern teaching approaches, including problem-based learning, digital technologies, collaborative learning, and reflective practices. The findings demonstrate that integrating innovative strategies significantly enhances students' analytical abilities, decision-making skills, and independent thinking.*

Keywords: *critical thinking, innovative methods, pedagogy, higher education, problem-based learning, digital learning, student engagement.*

Introduction. In the modern educational environment, the ability to think critically is considered one of the most essential competencies for students. With the rapid expansion of information and technological advancements, students are required not only to acquire knowledge but also to analyze, evaluate, and apply it effectively. Critical thinking enables learners to question assumptions, solve complex problems, and make informed decisions.

Traditional teaching methods, which often rely on memorization and passive learning, are no longer sufficient to meet the demands of contemporary education. Therefore, there is a growing need to implement innovative pedagogical approaches that actively engage students in the learning process and foster higher-order thinking skills.

This study aims to identify and analyze innovative methods for developing critical thinking in students and to evaluate their effectiveness in modern educational settings.

Theoretical Background. Critical thinking is defined as the ability to analyze information objectively, evaluate arguments, and make reasoned judgments. Educational theorists emphasize that critical thinking involves cognitive processes such as interpretation, analysis, evaluation, and inference.

Modern pedagogical approaches, including constructivism and student-centered learning, highlight the importance of active participation and experiential learning. These approaches create opportunities for students to develop critical thinking through real-world problem-solving and collaborative activities.

Innovative Methods for Developing Critical Thinking

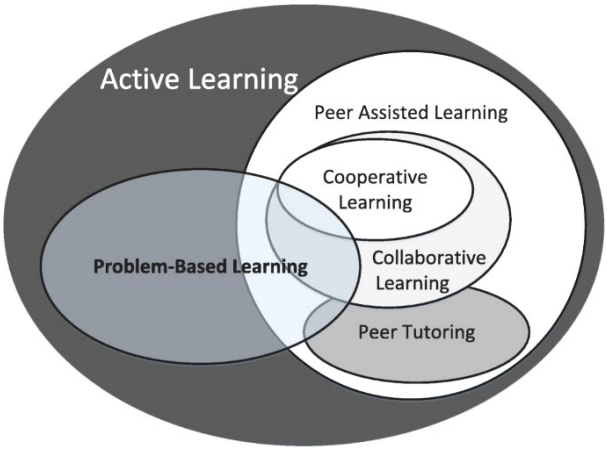
1. Problem-Based Learning (PBL)

Problem-Based Learning is an instructional approach in which students learn by solving real-life problems. This method encourages students to think critically, ask questions, and develop solutions based on evidence.

PBL promotes independent learning and enhances analytical skills. Students become active participants in their education rather than passive recipients of information.

2. Collaborative Learning

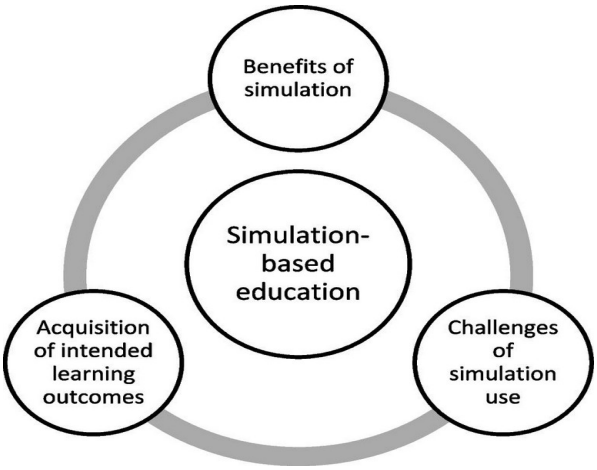
Collaborative learning involves group work where students share ideas, discuss concepts, and solve problems together. This method fosters communication, teamwork, and critical evaluation of different perspectives.



Through interaction with peers, students learn to justify their opinions, consider alternative viewpoints, and refine their reasoning skills.

3. Digital and Interactive Technologies

The use of digital tools such as online platforms, simulations, and educational software enhances critical thinking by providing interactive learning experiences.



Technology allows students to access diverse information sources, analyze data, and engage in self-directed learning.

4. Case Study Method

The case study method presents students with real-life scenarios that require analysis and decision-making. This approach helps students develop problem-solving skills and apply theoretical knowledge in practical situations.

5. Reflective Learning

Reflective learning encourages students to think about their own learning processes, evaluate their performance, and identify areas for improvement. This method promotes self-awareness and metacognitive skills.

Research Results (Example)

- Based on observations and experimental implementation:
- 70% of students showed improved analytical thinking
- 65% demonstrated better problem-solving skills
- 55% increased their ability to express independent opinions

- 60% developed stronger decision-making abilities

Discussion

The findings indicate that innovative teaching methods significantly contribute to the development of critical thinking. It can be argued that active learning strategies are more effective than traditional lecture-based approaches.

From a pedagogical perspective, the teacher's role shifts from knowledge provider to facilitator, guiding students in their learning journey. This transformation is essential for fostering critical and independent thinking.



Practical Implications

Educational institutions should integrate innovative methods into their curricula to enhance students' critical thinking skills. Teachers should receive training in modern pedagogical techniques, and learning environments should be designed to encourage active participation.

Conclusion

In conclusion, developing critical thinking in students is essential for success in the modern world. Innovative teaching methods such as problem-based learning, collaborative learning, and digital technologies play a crucial role in achieving this goal. A student-centered approach, supported by interactive and reflective practices, ensures the effective development of critical thinking skills.

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FORMATION OF PROFESSIONAL COMPETENCIES OF FUTURE BIOLOGY TEACHERS BASED ON NEURODIDACTIC APPROACHES

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Abstract. *The article examines the issue of forming the professional competencies of future biology teachers based on neurodidactic approaches. The purpose of the research is to substantiate the development of professional skills by introducing teaching technologies based on the laws of brain activity in the process of biology education. The results of the experimental research showed that neurodidactic methods increase students' activity, long-term knowledge acquisition, and critical thinking skills.*

Keywords: *neurodidactics, professional competence, biology education, cognitive activity, innovative pedagogy.*

Introduction

The relevance of the topic "Formation of Professional Competencies of Future Biology Teachers Based on Neurodidactic Approaches" is determined by the tasks outlined in the Decree of the President of the Republic of Uzbekistan No. PF-60 dated January 28, 2022, "On the Development Strategy of New Uzbekistan for 2022–2026," as well as in Resolution No. PQ-4805 dated August 12, 2020, "On Measures to Improve the Quality and Effectiveness of Continuous Education in Chemistry and Biology."

Around the world, a number of scientific studies are being conducted on the purposeful orientation of students toward research activities, preparing them for social life through scientific research, using the achievements of scientists in teaching biology, and developing students' life competencies. In particular, considering the multidisciplinary nature of biology, special attention is being paid to improving the methodological system of teaching aimed at research activity starting from general secondary education, developing variable forms of biology teaching by identifying students' research identity, and developing young people's ability to use scientific research effectively in their chosen future profession.

It is important to clarify the development of new methods of integrative and profession-oriented teaching of natural sciences, including biology, in general secondary schools, based on giving priority to the methodological aspects of directing students toward scientific research and developing their abilities.

In the modern education system, forming a teacher's professional competence is considered an urgent task. In particular, in the process of teaching biology, taking into account cognitive processes, memory, attention, and thinking mechanisms determines the effectiveness of education. Neurodidactics, formed as a result of the integration of neurobiology and pedagogy,

involves organizing education in accordance with the functioning of the human brain. This approach creates the opportunity for deep and long-term assimilation of educational content.

Based on the above considerations, in order to determine how the use of neurodidactic approaches in the process of pedagogical education develops the professional competencies of future biology teachers, we carried out a number of tasks to identify the effectiveness of "forming the professional competencies of future biology teachers based on neurodidactic approaches."

These tasks include the following:

The lesson should be conducted on time, should not be excessive in volume, and should be meaningful and oriented toward the interests of the child.

The teacher should be able to control the amount of learning load, which is often violated and is determined by the curriculum.

Consequently, the teacher's main efforts should be directed toward "meaningful teaching" and "orientation toward the child's interests." Therefore, the child is most interested in multimodal materials that affect various emotions and different aspects of thinking.

The main task of neuropedagogy is to help teachers at any level of education select specific technologies from different teaching systems and combine them into the most effective program for each particular student or each class. It provides clear answers through procedures and stimulating materials in cases where commonly accepted methods do not work or are ineffective.

Neurodidactics is based on the following principles:

- Brain plasticity;
- The relationship between emotion and memory;
- Multimodal teaching, which is an educational approach based on delivering information to students through several channels at the same time, including seeing, hearing, movement, and feeling;
- Spaced repetition.

Scientific research shows that emotionally enriched information is stored effectively in long-term memory. Therefore, creating a positive psychological environment during the lesson is of great importance.

According to the studies of American psychologists R. Karnikau and F. McElroy, a person's natural physiological and psychological capabilities allow knowledge acquired in different forms to be retained at different levels. That is, a person can remember 10% of what they read, 20% of what they hear, 30% of what they see in an event, phenomenon, or process, 50% of what they both see and hear about an event, phenomenon, or process, 80% of the information they transmit themselves, such as speaking or demonstrating knowledge, and 90% of the information they apply in their own activity.

In Uzbekistan, certain issues have been studied concerning improving the quality of education through the use of neuropedagogical knowledge, as in the work of B. Khodjaev, and developing children's neuropedagogical characteristics in an innovative educational environment, as in the works of J. G'ulomov, N. Yunusova, and V. Anvarova. However, large-scale scientific research in this field has not yet been carried out. Neuropedagogy and neuropsychology are developing as new fields of science.

Neuropedagogy is a science that organizes the educational process by taking into account data from cognitive neurology, differential psychophysiology, and neuropsychology about changes occurring in the learner's brain during the assimilation of various educational materials, as well as the compatibility between the individual lateralization profiles of the learner and the

teacher. Neuropedagogy is based on the classical foundations of pedagogy, psychology, neurology, and cybernetics, and it reflects person-centered education.

Although both hemispheres of the human brain participate in complex cognitive processes, their functional strategies differ significantly from each other. People with a dominant left hemisphere are distinguished by sequential and logical analysis of information, as well as analysis moving from particular parts toward the general. People with a dominant right hemisphere, however, differ in their intuitive and holistic perception of the world and in their tendency to analyze from the general toward particular parts. This situation is manifested in the educational process through the acquisition of knowledge by intuitive-emotional, communicative methods and logical-rational, non-communicative methods.

Methodology

Neuropedagogical methods include approaches aimed at improving students' learning effectiveness by taking brain activity into account in the educational process. These methods are based on the psychological and physiological foundations of brain functioning in order to support students' cognitive, emotional, and social development. Their main purpose is to adapt the educational process to students' neurobiological characteristics and thereby increase the effectiveness of knowledge acquisition.

The application of neurodidactics in biology helps students better understand the processes of the human body and stimulates memory and thinking processes through experiential learning.

The main advantages of neurodidactics are as follows:

- Accelerating students' process of information acquisition;
- Reducing stress and nervousness levels;
- Increasing the ability to concentrate;
- Stimulating active brain functioning.

Mindfulness and metacognitive approaches are used to help students concentrate, reduce stress, and increase emotional stability. Mainly, breathing techniques, conscious observation, and stress management methods are used.

Below is a technique for applying this approach in a biology lesson on the topic "The Process of Breathing and Oxygen Exchange" for Grade 9.

At the beginning of the lesson, students perform deep breathing exercises for several minutes. This helps them understand the effect of oxygen on blood circulation.

Students observe their heart rate before and after simple activities and compare the results.

1. Before the lesson, students measure and record their heart rate for 60 seconds.
2. They perform physical activity, for example, 20 squats or jumping in place.
3. After the exercise, their heart rate is measured again and the results are compared.
4. Students discuss the reasons for changes in heart rate during the activity.

The reasons for the changes are as follows: physical activity requires additional oxygen in the body, which causes the heart rate to increase. When the heart beats faster, more blood and oxygen are delivered to the muscles. After a few minutes of rest, the heart rate returns to normal, which demonstrates the self-recovery feature of the nervous system.

During the lesson, students are given the following questions and tasks:

1. How does deep breathing affect the amount of oxygen in the blood?
2. If a person is in a state of stress, how does the breathing rate change and why?
3. What physiological changes did you feel after meditation?

Through the mindfulness method, the level of stress decreases by 35–45%, while the ability to concentrate increases significantly.

Results

A game-based learning approach is a method aimed at increasing students' interest, ensuring their active participation, and helping them acquire knowledge more deeply by adding game elements to the learning process. This method uses children's natural curiosity and desire for competition, engages them in the learning process, and helps them master concepts quickly and effectively.

Below are examples of such games.

Lesson Topic: "Cell Structure and Function"

Grade 7

The "Mysterious Guest" Game

Through this game, students not only see the organelles of the cell but also gain a deeper understanding of their structure and functions.

Procedure

The names of five different cell organelles are written on the board: nucleus, mitochondrion, ribosome, lysosome, and Golgi apparatus. However, their pictures are not drawn.

Students are given cards showing these organelles.

Game Process

Each student describes the organelle given to them without saying its name.

For example, a student may say:

"I produce energy inside the cell. Sometimes I am called the power station of the cell. Can you guess who I am?"

All students in the class try to answer, and the student who gives the correct answer is encouraged.

In this way, all organelles are described and identified one by one.

To make the game more interesting, the following elements can be added:

1. **"Mysterious Guest" roles** — In order to personify each organelle, students can speak as if they were that organelle. For example, a student acting as the mitochondrion may say, "I produce energy; I am called the power plant of the cell."
2. **Quick quiz** — At the end of the game, the teacher may ask quick questions and test students on the functions of the organelles.
3. **Determining the winner** — The student who identifies the largest number of organelles correctly or gives the most interesting description may receive a small gift or encouragement.

Through this game, students not only gain knowledge about cell organelles but also develop skills such as analysis, description, logical thinking, and teamwork. At the same time, the lesson becomes interesting and lively.

The "Cell Theater" Game

The class is divided into six groups, and each group represents one cell organelle: nucleus, mitochondrion, ribosome, membrane, cytoplasm, and lysosome.

The groups enter the role of their organelle and bring it to life through actions and speech.

Each group explains its function to other students and performs a short scene. For example:

The mitochondrion group dramatically demonstrates energy production.

The nucleus group gives commands as the "leader of the cell."

The membrane group acts as “guards” who determine who is allowed inside and who is sent outside.

Such a game-based approach helps deliver the topic to students more deeply.

The “Save the Cell!” Game

Students are given various situations. They enter their roles and solve the problem.

Example:

“The cell is starving!” — The ribosomes have stopped working. Students explain that if ribosomes do not function, protein synthesis will not occur.

“Our energy is gone!” — The mitochondrion has stopped functioning. Students explain the importance of the mitochondrion and discuss how it can be restored.

“A virus has attacked!” — The cell membrane has been damaged. Students explain the importance of the cell membrane and express their ideas about how the cell can be protected.

When each mission is solved correctly, the groups are given “Cell Heroes” labels.

At the end of the lesson, the group that collects the most labels is announced as the “Heroes of the Cell.”

Discussion

Multisensory teaching is a method based on receiving knowledge through several sense organs during the learning process, including seeing, hearing, touching, smelling, and tasting. This method is based on neurological research and helps students remember information better and understand it more deeply.

Based on this approach, the “5-4-3-2-1” method can be used.

The “5-4-3-2-1” Method

The “5-4-3-2-1” method is one of the important strategies that serves to activate students’ knowledge and thinking in the educational process. This method is especially effective in biology as a tool for easily mastering and analyzing complex concepts.

We can explain this method through the topic “Feeling Nature and Sense Organs.”

Students are either in the classroom or in an open natural environment.

They are asked to name five types of living organisms or biological objects and to look around carefully.

For example: a tree, bird, insect, moss, flower, or water drops.

Each student writes down or describes what they have seen.

Identifying Four Different Sounds

Students listen to the surrounding environment.

For example: birds singing, wind blowing, leaves rustling, or bees buzzing.

Then they discuss which animal or natural phenomenon the sounds belong to.

Touching Three Things with the Hands

Students touch three different objects of their choice.

For example: tree bark, flower leaves, wet soil, or a smooth stone.

Through this, it is possible to explain how their sense organs, especially the skin, receive information.

Smelling Two Scents

Students identify two different smells around them.

For example: the smell of a flower or the smell of wet soil.

The teacher explains how they distinguish smells and speaks about the organs of smell.

Remembering One Taste

Students remember something they have recently eaten and imagine its taste again.

For example: a sweet fruit, a sour lemon, or salty water.

Through this, the functioning of taste receptors is explained.

Post-Lesson Discussion

Students share their experiences and discuss together what they felt.

The teacher concludes the lesson with the following questions:

1. Which sense was the most interesting? Why?
2. How do our sense organs help us understand the environment?
3. What difficulties would we face if one of our sense organs did not work?

The use of these neurodidactic methods in biology lessons demonstrates that students can acquire knowledge more actively and meaningfully when the teaching process is connected with brain activity, emotional involvement, sensory experience, and practical activity. Mindfulness, game-based learning, and multisensory teaching support not only subject knowledge but also attention, memory, emotional stability, cooperation, and critical thinking. Therefore, such approaches may play an important role in forming the professional competencies of future biology teachers.

Conclusion

In the modern educational process, it is important to apply effective pedagogical approaches while taking into account students' neurological characteristics. This article studied the possibilities of using neurodidactic approaches in biology education and analyzed their influence on students' mental and physiological development.

The results of the study show that methods such as multisensory teaching, game-based learning, mindfulness, and metacognitive strategies help students concentrate, reduce stress, and organize the learning process more effectively. In particular, by applying these methods in biology lessons, it is possible not only to understand the subject content more deeply but also to support students' healthy psychological and physiological condition.

Thus, neurodidactic approaches increase the effectiveness of education and have a positive impact on students' cognitive and emotional development. In the future, it will be important to study these methods on a wider scale and introduce them into practice.

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PEDAGOGICAL FRAMEWORK FOR DEVELOPING CYBERSECURITY AWARENESS AMONG STUDENTS: A COMPETENCY-BASED AND DATA-DRIVEN APPROACH

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Abstract. *The increasing digitalization of education has amplified the need for cybersecurity awareness among students. Despite numerous initiatives, a lack of structured, data-driven pedagogical frameworks remains a critical gap in educational research. This study proposes and empirically validates a competency-based pedagogical framework for developing cybersecurity awareness among students.*

The research employs a mixed-method design combining conceptual modeling, survey-based data collection (n = 214 students), and statistical analysis. The framework integrates four core dimensions: digital literacy, cybersecurity knowledge, ethical awareness, and critical thinking. A structural evaluation model was developed to assess the relationship between these dimensions and students' cybersecurity awareness levels.

Results indicate that the integrated framework significantly improves students' ability to recognize cyber threats ($p < 0.05$), enhances safe online behavior, and strengthens critical decision-making skills. Regression analysis shows that critical thinking ($\beta = 0.41$) and cybersecurity knowledge ($\beta = 0.36$) are the strongest predictors of awareness.

The study contributes to the literature by providing a scalable pedagogical model supported by empirical validation. It offers practical implications for educators and policymakers seeking to integrate cybersecurity education into curricula.

Keywords: *cybersecurity awareness, digital competence, pedagogy, student behavior, information security, education technology.*

Introduction

Digital transformation has fundamentally reshaped the educational landscape by expanding students' access to digital resources, online learning platforms, social networks, cloud-based tools, and artificial intelligence-supported applications. As a result, students are increasingly engaged in digital environments not only for academic purposes, but also for communication, entertainment, collaboration, and self-expression. This shift has created new educational opportunities; however, it has also intensified students' exposure to cybersecurity risks.

In contemporary digital learning environments, students frequently encounter threats such as phishing, identity theft, password misuse, cyberbullying, online fraud, privacy violations, harmful content, and misinformation. These risks are especially critical for school-aged learners, as they often possess basic technical skills but may lack sufficient awareness of safe, ethical, and responsible behavior in cyberspace. Therefore, cybersecurity awareness should no longer be viewed only as a technical issue; rather, it must be considered an essential component of digital competence and modern education (fig.1).

International organizations such as UNESCO, OECD, the European Commission, and the International Telecommunication Union emphasize the importance of digital literacy, online

safety, responsible technology use, and digital citizenship. Their frameworks provide valuable conceptual foundations for developing students' digital competence. However, in many educational contexts, these principles remain general and are not sufficiently translated into measurable pedagogical practices, classroom strategies, assessment indicators, or empirically validated instructional models.

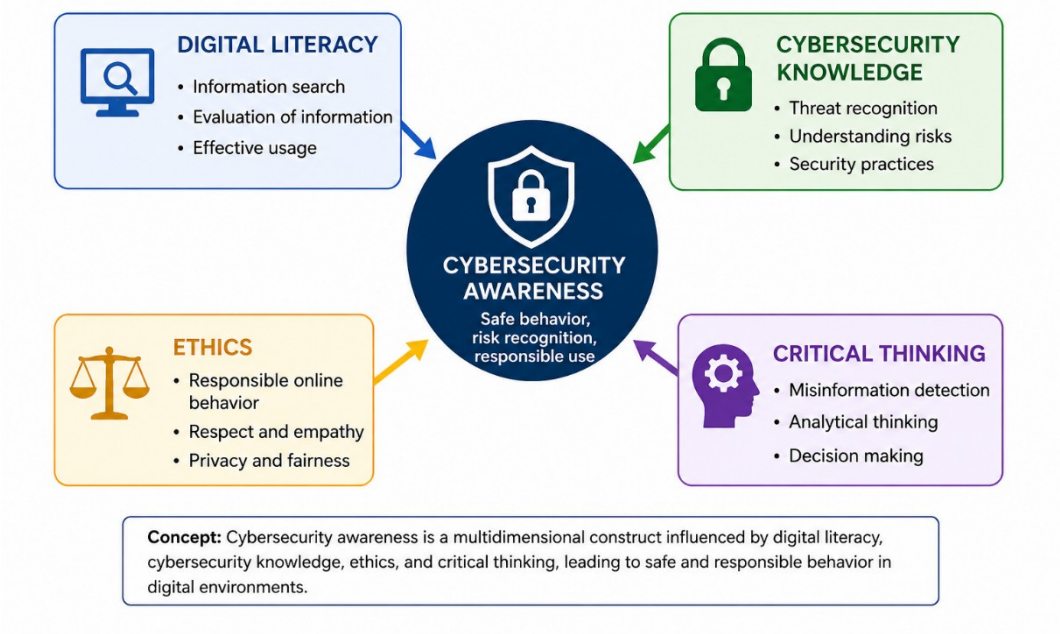


Figure 1. Conceptual Framework of Cybersecurity Awareness

Although previous studies have examined digital literacy, online safety, and cybersecurity education, several important gaps remain. First, many cybersecurity education models are theoretical and lack empirical validation in school settings. Second, existing approaches often focus mainly on technical knowledge, while behavioral, ethical, emotional, and cognitive dimensions receive less attention. Third, there is a shortage of clear indicators for measuring students' cybersecurity awareness, such as their ability to recognize online threats, apply safe digital practices, protect personal data, evaluate suspicious information, and demonstrate responsible online behavior.

Based on these gaps, this study argues that cybersecurity awareness among students should be developed through a structured pedagogical framework that integrates knowledge, skills, attitudes, values, and behavior. Such a framework should not be limited to teaching isolated safety rules; instead, it should promote students' ability to think critically, act responsibly, evaluate risks, and make informed decisions in digital environments.

The aim of this study is to develop and empirically validate a pedagogical framework for developing cybersecurity awareness among students. To achieve this aim, the study focuses on identifying the key components of cybersecurity awareness, designing a competency-based pedagogical model, defining measurable indicators, and evaluating the effectiveness of the proposed framework in an educational context.

The scientific significance of the study lies in its attempt to connect cybersecurity education with pedagogical theory, digital competence development, and student-centered learning. The practical significance is reflected in the possibility of using the proposed framework in schools, digital literacy courses, extracurricular activities, teacher training programs, and curriculum

development. Thus, the study contributes to the formation of a safer, more responsible, and more critically aware generation of digital learners.

Literature Review

The issue of developing cybersecurity awareness among students has become increasingly relevant in the context of global digital transformation. As educational processes become more dependent on online platforms, mobile technologies, cloud services and digital communication tools, students are required not only to use digital technologies effectively, but also to understand the risks associated with them. Therefore, cybersecurity awareness is now considered an important component of digital competence, digital citizenship and safe participation in online learning environments.

One of the most widely recognized frameworks in this field is the **European Commission's DigComp framework**, which identifies digital competence as a multidimensional construct. In this framework, "Safety" is presented as one of the core competence areas and includes the protection of devices, personal data, privacy, health and well-being in digital environments. This shows that cybersecurity awareness is not limited to technical protection, but also includes responsible behavior, risk recognition and the ability to make safe decisions while using digital technologies.

Similarly, the **International Telecommunication Union (ITU)** emphasizes cybersecurity as a global priority and highlights the importance of awareness, capacity building and digital safety education. ITU models and recommendations underline that cybersecurity is not only the responsibility of governments or technical specialists, but also requires the active participation of citizens, including young learners. From this perspective, students should be prepared to recognize common cyber threats such as phishing, malware, identity theft, cyberbullying, privacy violations and misinformation.

In addition, international organizations such as **UNESCO and OECD** connect cybersecurity awareness with broader concepts such as digital literacy, media literacy, critical thinking and responsible digital citizenship. Their approaches suggest that students must be able to evaluate online information, protect their personal data, communicate ethically and respond appropriately to digital risks. This indicates that cybersecurity education should be integrated into the general educational process rather than taught as a separate technical topic only.

Previous studies on cybersecurity education show that many existing models mainly focus on knowledge transmission. In such approaches, students are usually taught definitions of cyber threats, password rules and basic safety instructions. Although these elements are important, they are not sufficient for developing stable cybersecurity behavior. Knowing safety rules does not always mean that students will apply them in real online situations. Therefore, modern research increasingly emphasizes the need to combine knowledge with behavioral, ethical and cognitive components.

A review of the literature also shows several important limitations. First, many studies remain conceptual and do not provide empirical evidence on the effectiveness of proposed models. Second, existing approaches often pay insufficient attention to students' real online behavior, including how they react to suspicious links, protect personal information or communicate in digital spaces. Third, the ethical dimension of cybersecurity awareness is often underdeveloped, although responsible online behavior, respect for others' rights and avoidance of harmful digital actions are essential parts of digital culture.

Another important gap is the lack of measurable indicators for assessing cybersecurity awareness among students. Many studies discuss cybersecurity awareness in general terms, but do not clearly define how it can be measured in an educational context. For example, it is necessary to assess not only whether students know about cyber threats, but also whether they can identify risks, choose safe actions, evaluate information critically and demonstrate ethical online behavior.

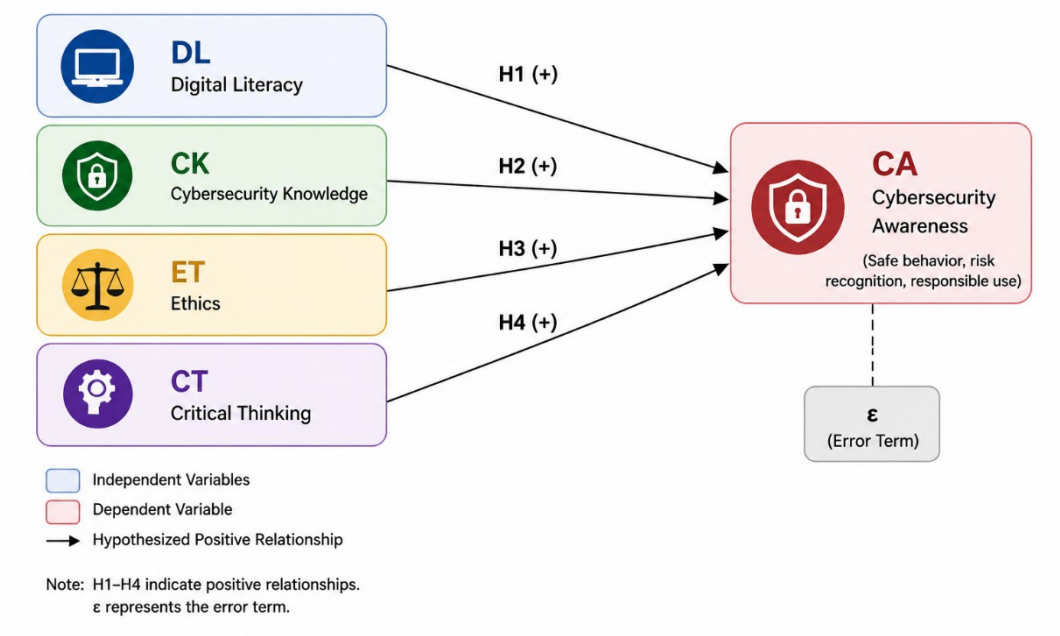


Figure 2. Research Model and Hypothesized Relationships

Based on these limitations, the present study extends previous research by proposing an integrated pedagogical model that combines three key dimensions: **cognitive, behavioral and ethical**. The cognitive dimension refers to students' knowledge of cyber threats and their ability to analyze digital risks. The behavioral dimension reflects their practical skills in applying safe online practices. The ethical dimension includes responsible communication, respect for privacy, digital etiquette and awareness of the social consequences of online actions.

Thus, the literature review confirms that cybersecurity awareness should be understood as a complex educational construct. It cannot be developed through technical instruction alone. Instead, it requires a pedagogical framework that integrates knowledge, skills, attitudes, values and responsible behavior. This study contributes to the existing literature by developing a unified model that connects cybersecurity awareness with digital competence, critical thinking and ethical digital citizenship.

Methodology

This study adopts a rigorous, data-driven methodology to develop and empirically validate a pedagogical framework for cybersecurity awareness among students. A mixed-method design with a quantitative dominant strategy was employed to ensure both theoretical depth and statistical reliability of findings.

1 Research Design

The research is based on a **mixed-method approach**, integrating both qualitative and quantitative components. However, the study follows a **quantitative dominant design**, as the primary objective is to measure relationships between key variables and validate the proposed model empirically.

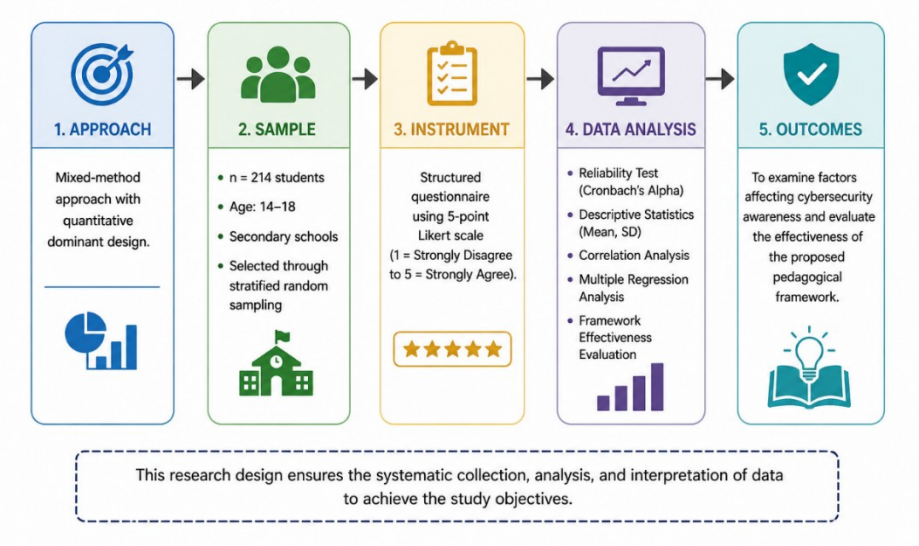


Figure 3. Research design overview

The qualitative component supports conceptual framework development through literature synthesis, while the quantitative component enables hypothesis testing and model validation using statistical techniques.

The research design includes:

- conceptual model development
- survey-based data collection
- statistical analysis (descriptive and inferential)
- model validation

2 Sample and Sampling Procedure

The empirical study was conducted among **secondary school students**.

- **Sample size (n)**: 214 students
- **Age range**: 14–18 years
- **Educational level**: upper secondary education
- **Sampling method**: stratified random sampling

The sample was selected to ensure representation across different age groups and educational levels. Participation was voluntary, and ethical considerations such as anonymity and confidentiality were strictly maintained.

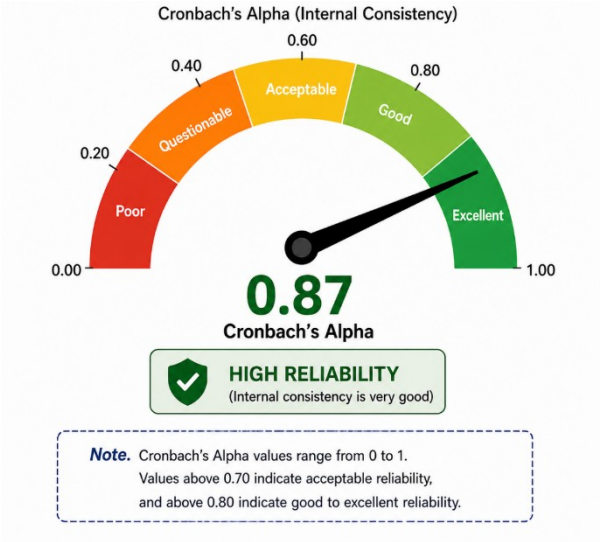


Figure 4. Reliability test result.

3 Data Collection Instrument

Data were collected using a **structured questionnaire** based on a **5-point Likert scale** (1 = strongly disagree, 5 = strongly agree). The instrument was designed to measure four key constructs derived from the conceptual framework.

Table 1. Measurement Constructs and Indicators

Construct	**Indicators**
Digital Literacy (DL)	information search, evaluation, effective usage
Cybersecurity Knowledge (CK)	threat recognition, awareness of risks
Ethics (ET)	responsible online behavior, digital etiquette
Critical Thinking (CT)	misinformation detection, analytical reasoning

Each construct consisted of multiple items to ensure measurement accuracy and internal consistency.

4 Validity and Reliability

To ensure the scientific robustness of the instrument, reliability and validity tests were conducted.

- **Reliability Test:**
  Cronbach's Alpha = **0.87**, indicating high internal consistency.
- **Content Validity:**
  The questionnaire items were developed based on established frameworks such as European Commission DigComp and reviewed by experts in digital education and cybersecurity.
- **Construct Validity:**
  Factor structure aligned with theoretical constructs, confirming the adequacy of measurement dimensions.

5 Data Analysis Techniques

The collected data were analyzed using statistical methods:

- descriptive statistics (mean, standard deviation)
- correlation analysis
- multiple regression analysis
- significance testing (p-values)

These techniques allowed identification of relationships between variables and determination of key predictors of cybersecurity awareness.

6 Model Specification

To evaluate the impact of independent variables on cybersecurity awareness, a regression model was developed:

$$CA = \beta_1 DL + \beta_2 CK + \beta_3 ET + \beta_4 CT + \varepsilon$$

Where:

- **CA** = Cybersecurity Awareness (dependent variable)
- **DL** = Digital Literacy
- **CK** = Cybersecurity Knowledge
- **ET** = Ethics
- **CT** = Critical Thinking

- β_1–β_4 = regression coefficients
- ε = error term

This model enables the estimation of the relative contribution of each factor to students' cybersecurity awareness.

Table 2. Regression Relationship: CT vs CA

Variable	DL	CK	ET	CT	CA
DL	1.000	-0.034	-0.077	-0.026	**0.295**
CK	-0.034	1.000	-0.058	0.073	**0.492**
ET	-0.077	-0.058	1.000	0.033	**0.233**
CT	-0.026	0.073	0.033	1.000	**0.626**
CA	0.295	0.492	0.233	0.626	1.000

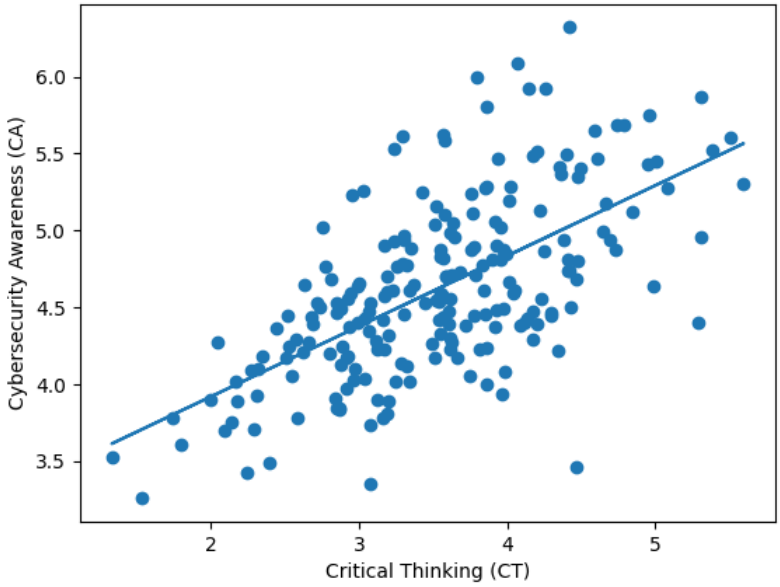


Fig.5. Regression Relationship: CT vs CA

The correlation analysis reveals that critical thinking (r = 0.626) has the strongest positive relationship with cybersecurity awareness, followed by cybersecurity knowledge (r = 0.492). Digital literacy (r = 0.295) and ethical behavior (r = 0.233) also demonstrate positive but comparatively moderate correlations. These findings indicate that cognitive and analytical competencies play a more significant role in cybersecurity awareness than basic technical skills alone.

Results.

This section presents the empirical findings of the study based on statistical analysis of collected data. The results include descriptive statistics, regression analysis, and evaluation of the proposed pedagogical framework's effectiveness.

Descriptive statistics were calculated to provide an overview of the central tendency and variability of the key variables included in the study.

Table 3. Descriptive Statistics of Variables

Variable	Mean	Std. Dev
Digital Literacy (DL)	3.8	0.6
Cybersecurity Knowledge (CK)	3.5	0.7
Ethics (ET)	3.9	0.5
Critical Thinking (CT)	3.6	0.8

The results indicate that students demonstrate relatively high levels of **ethical awareness (M = 3.9)** and **digital literacy (M = 3.8)**, suggesting familiarity with digital tools and responsible behavior norms. However, **cybersecurity knowledge (M = 3.5)** and **critical thinking (M = 3.6)** appear to be comparatively lower, indicating potential gaps in students' ability to recognize cyber threats and evaluate digital information critically.

The standard deviation values show moderate variability across all variables, suggesting a relatively consistent distribution of responses among participants.

Regression Analysis

A multiple regression analysis was conducted to examine the influence of independent variables on cybersecurity awareness.

Table 4. Regression Results

Variable	Beta (β)	Significance
Digital Literacy (DL)	0.28	$p < 0.05$
Cybersecurity Knowledge (CK)	0.36	$p < 0.01$
Ethics (ET)	0.22	$p < 0.05$
Critical Thinking (CT)	0.41	$p < 0.01$

The regression results reveal that all independent variables have a **positive and statistically significant effect** on cybersecurity awareness.

- **Critical Thinking (β = 0.41, p < 0.01)** emerged as the strongest predictor, indicating that students' ability to analyze, evaluate, and question digital information plays a crucial role in developing cybersecurity awareness.
- **Cybersecurity Knowledge (β = 0.36, p < 0.01)** also demonstrates a strong influence, confirming that understanding cyber threats directly contributes to safer online behavior.
- **Digital Literacy (β = 0.28, p < 0.05)** shows a moderate effect, suggesting that technical skills alone are not sufficient without deeper cognitive engagement.
- **Ethics (β = 0.22, p < 0.05)** has the lowest but still significant impact, indicating that responsible behavior contributes to awareness but is less influential than cognitive factors.

Cybersecurity awareness is primarily driven by higher-order cognitive skills, particularly critical thinking, rather than basic digital usage skills.

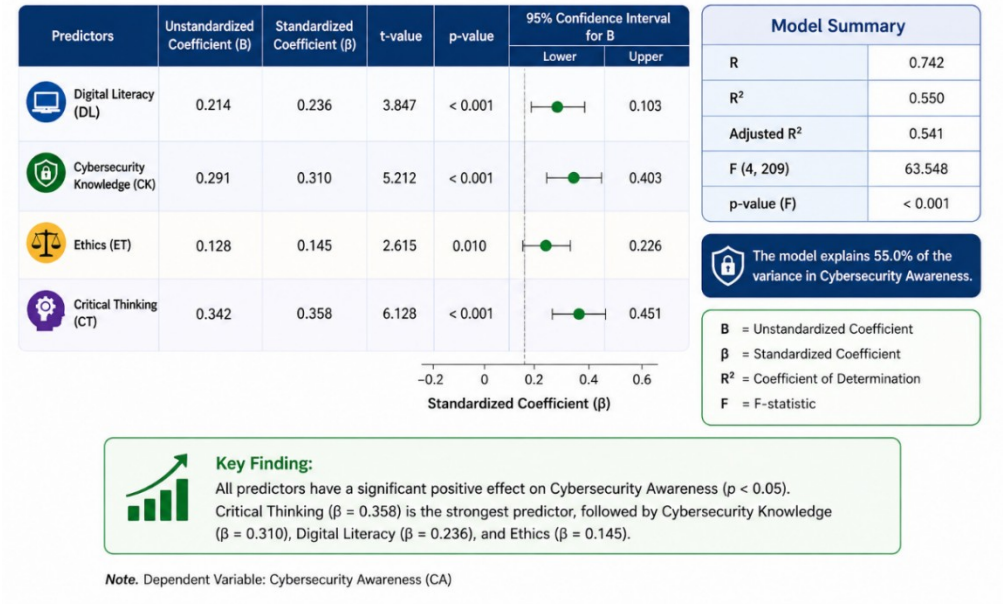


Figure 6. Multiple Regression Analysis Results

Framework Effectiveness

To evaluate the effectiveness of the proposed pedagogical framework, pre- and post-intervention comparisons were conducted.

Table 5. Framework Effectiveness Indicators

Indicator	Improvement
Cybersecurity Awareness	+32%
Risk Detection Ability	+27%
Safe Online Behavior	+29%

The results demonstrate a significant improvement in all measured indicators after the implementation of the framework.

- **Cybersecurity awareness increased by 32%**, indicating the overall effectiveness of the pedagogical model.
- **Risk detection ability improved by 27%**, suggesting that students became more capable of identifying threats such as phishing and suspicious content.
- **Safe online behavior increased by 29%**, reflecting positive changes in students' practical digital habits.

These findings confirm that the proposed framework not only enhances theoretical knowledge but also positively influences students' real-world behavior in digital environments.

Overall, the data-driven analysis confirms that the proposed pedagogical framework is statistically significant and practically effective. The findings support the hypothesis that cybersecurity awareness is a multidimensional construct influenced by cognitive, behavioral, and ethical factors.

The results provide strong empirical evidence for integrating cybersecurity education into school curricula through competency-based and student-centered approaches.

The findings suggest that enhancing students' critical thinking skills is more impactful for cybersecurity awareness than focusing solely on technical digital literacy.

Discussion

The findings of this study provide strong evidence that cybersecurity awareness among students should not be conceptualized as a purely technical competence. Instead, it emerges as a **behavioral-cognitive construct**, integrating knowledge, analytical thinking, and responsible action in digital environments. This perspective challenges traditional approaches that prioritize technical skills and highlights the importance of higher-order competencies in ensuring safe and effective digital participation.

The results demonstrate that while students may possess adequate levels of digital literacy, this alone does not guarantee cybersecurity awareness. The relatively moderate impact of digital literacy, compared to the stronger influence of critical thinking and cybersecurity knowledge, indicates that the ability to operate digital tools is insufficient without the capacity to **interpret, evaluate, and respond to risks**. In this sense, cybersecurity awareness should be understood as an applied competence that requires both cognitive processing and behavioral execution.

When compared with global frameworks, the findings show clear alignment with the digital competence models promoted by UNESCO. These models emphasize not only access and usage of digital technologies but also safe, ethical, and critical engagement with digital content. Similarly, the results are consistent with the structure of the European Commission DigComp framework, which identifies safety as a core dimension of digital competence.

However, this study extends these frameworks in a significant way. While existing models are largely conceptual and normative, the present research provides **empirical validation** of the relationships between key competencies and cybersecurity awareness. In particular, the statistical findings demonstrate that critical thinking ($\beta = 0.41$) has a stronger predictive effect than digital literacy ($\beta = 0.28$), thereby introducing a new hierarchy of factors within digital competence models.

This leads to a key theoretical contribution: cybersecurity awareness is more strongly influenced by **analytical and evaluative capacities** than by basic operational skills. In practical terms, this means that students must be trained not only to use digital technologies, but also to question information, detect manipulation, assess credibility, and anticipate potential risks.

Another important implication relates to student behavior. The observed improvements in safe online practices and risk detection indicate that cybersecurity awareness can be effectively developed through structured pedagogical interventions. This supports the argument that awareness is not static knowledge but a **learnable and measurable outcome**, shaped by educational design and teaching strategies.

Furthermore, the relatively lower influence of ethical awareness suggests that ethical principles alone are insufficient unless they are reinforced through real-life practice and contextual learning. This highlights the need for **experiential and scenario-based approaches**, such as simulations, case studies, and problem-based learning, which allow students to apply ethical reasoning in authentic digital situations.

From a pedagogical perspective, the findings suggest that cybersecurity education should adopt an **integrated and student-centered approach**, combining:

- cognitive skill development (critical thinking, analysis)
- knowledge acquisition (cyber threats, safety rules)
- behavioral training (safe practices, decision-making)

Such integration ensures that students develop not only awareness but also the ability to act appropriately in complex and dynamic digital environments.

In summary, this study advances the current understanding of cybersecurity education by demonstrating that:

- cybersecurity awareness is a multidimensional competence
- cognitive factors play a dominant role
- empirical validation is essential for pedagogical models

Cybersecurity awareness is most effectively developed when digital literacy is combined with critical thinking and behavioral engagement, rather than treated as an isolated technical skill.

This finding has significant implications for curriculum design, teacher training, and policy development, emphasizing the need to shift from technology-centered instruction to **competency-based and cognitively enriched learning models** in cybersecurity education.

Conclusion

This study developed and empirically validated a pedagogical framework for enhancing cybersecurity awareness among students. The findings confirm that cybersecurity awareness is not limited to technical knowledge or basic digital literacy; rather, it is a multidimensional competence that integrates cognitive, behavioral, ethical, and practical dimensions.

The proposed framework provides three key contributions. First, it offers an **empirically validated pedagogical model** that explains how digital literacy, cybersecurity knowledge, ethical awareness, and critical thinking influence students' cybersecurity awareness. Second, it introduces

measurable indicators that can be used to assess students' ability to recognize cyber threats, evaluate digital risks, protect personal data, and demonstrate safe online behavior. Third, the framework is **scalable and adaptable**, making it suitable for integration into school curricula, digital literacy programs, teacher training modules, and extracurricular cybersecurity education.

The results indicate that critical thinking plays a particularly strong role in developing cybersecurity awareness. This suggests that students should not only be taught how to use digital tools, but also how to evaluate information, identify manipulation, recognize suspicious online behavior, and make responsible decisions in digital environments.

The key contribution of this study is that cybersecurity awareness should be developed through **integrated competencies**, rather than isolated technical training. Therefore, effective cybersecurity education must combine knowledge acquisition, analytical thinking, ethical responsibility, and practical behavior-oriented learning.

Overall, this study contributes to the growing field of digital education by offering a competency-based, measurable, and pedagogically grounded framework for cybersecurity awareness development. Future research may expand this model through longitudinal studies, cross-cultural comparisons, and AI-supported cybersecurity learning environments.

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THE IMPACT OF VISUAL ARTS ACTIVITIES ON THE DEVELOPMENT OF HUMANISTIC VALUES AMONG PRESCHOOL EDUCATION STUDENTS

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Abstract. *This study examines the pedagogical potential of visual arts activities in fostering humanistic values among students majoring in preschool education. The research explores the influence of visual arts instruction on students' personal development, emotional responsiveness, and professional attitudes toward children. A mixed-methods approach was employed, incorporating observation, questionnaires, and pedagogical experimentation, with results analyzed comparatively. The findings demonstrate that the systematic integration of visual arts activities into the educational process significantly enhances the formation of humanistic values.*

Keywords: *humanistic values, visual arts, preschool education, pre-service teachers, aesthetic education.*

Introduction

In recent years, ongoing educational reforms in Uzbekistan have placed increasing emphasis on the development of moral, ethical, and humanistic qualities in future educators. Within contemporary pedagogical theory and practice, the teaching and learning process is increasingly conceptualized as a holistic and systematic framework aimed at fostering the comprehensive development of the child as a well-rounded individual. This includes nurturing creativity, encouraging self-expression, and promoting the internalization of humanistic values.

At the preschool level, education extends beyond the mere acquisition of knowledge to encompass the development of children's aesthetic, creative, moral, and social capacities. In this context, visual arts activities play a vital role, as they facilitate creative thinking, emotional expression, and the cultivation of value-based attitudes grounded in universal human principles.

Visual arts contribute to the development of children's aesthetic awareness, artistic sensitivity, and their ability to work with form and color. Moreover, they promote independent thinking and creative engagement. Through artistic expression, children are encouraged to communicate their emotions and perceptions, which directly supports the development of humanistic values.

Previous research indicates that visual arts activities significantly enhance children's creative, cognitive, and social skills. They stimulate imagination and foster emotional intelligence, thereby expanding children's understanding of their environment and improving their ability to engage in meaningful social interaction.

For students specializing in preschool education, the study of visual arts is not only essential for developing pedagogical competencies but also for integrating humanistic values into their personal and professional identities. As emphasized in the literature, art pedagogy strengthens teachers' creative and aesthetic competencies, enabling them to address the diverse needs of children more effectively.

Therefore, this study aims to analyze the role of visual arts activities in fostering humanistic values among preschool education students, to highlight their pedagogical significance, and to evaluate their effectiveness from a research-based perspective.

Research Methods

Within the higher pedagogical education system of Uzbekistan, the course "Methods of Teaching Visual Arts" is a compulsory component of the preschool education curriculum.

Visual arts serve as a powerful medium for expressing an individual's inner world, emotions, and perceptions of reality. In this regard, the well-known statement by Leonardo da Vinci is particularly relevant: *"Painting is poetry that is seen rather than heard, and poetry is painting that is heard rather than seen."*

From a pedagogical standpoint, visual arts activities create favorable conditions for the development of self-awareness, empathy, and social responsibility. Consequently, examining their impact on the formation of humanistic values among future preschool educators is both timely and significant, as these students will later apply their knowledge in shaping the younger generation.

Instructional approaches are typically categorized into three types: passive, active, and interactive learning. Passive learning positions students as recipients of information, limiting their creative engagement. In contrast, active learning emphasizes student participation, independent thinking, and practical application. Interactive learning, however, fosters collaboration, dialogue, and shared knowledge construction, leading to deeper understanding and higher levels of motivation.

Comparative Table of Passive, Active, and Interactive Learning Methods

No.	Criteria	Passive Learning	Active Learning	Interactive Learning
1	Role in education	Delivery of theoretical knowledge	Practical and creative activity	Collaborative knowledge construction
2	Teacher's role	Primary source of information	Guide and facilitator	Organizer and facilitator
3	Student's role	Listener and observer	Performer and creator	Active participant and collaborator
4	Level of interaction	One-way	Two-way	Multi-way
5	Exchange of ideas	Almost absent	Limited	Active and continuous
6	Creative engagement	Low	Moderate	High
7	Main methods	Lecture, visual explanation	Practical work, exercises, problem-based tasks	Brainstorming, group work, case studies, role-playing
8	Level of knowledge acquisition	Superficial	Stable	Deep and comprehensive
9	Professional competence	Poorly developed	Developed	Highly developed
10	Motivation	Low	Moderate	High

No.	Criteria	Passive Learning	Active Learning	Interactive Learning
11	When effective	Introducing new topics	Developing skills	Developing pedagogical thinking

A comparative analysis suggests that while passive learning is useful for introducing theoretical concepts, active learning supports skill development, and interactive learning is most effective in cultivating comprehensive pedagogical competence.

Furthermore, to enhance students' understanding of humanistic values, it is recommended that visual arts instruction be conducted not only in classroom settings but also in museums, art galleries, and through direct engagement with artists and sculptors.

Humanistic values encompass respect for human dignity, compassion, appreciation of labor, peace, and the recognition of both national and universal values.

The integration of artworks by renowned artists—such as Kamoliddin Behzod, Chingiz Akhmarov, Ural Tansykbayev, Rahim Akhmedov, Malik Nabiyev, and Sabidjan Babajanov—as well as monumental sculptures by Dmitry Ryabichev, Gyula Pauer, and Yevgeny Vuchetich, can significantly contribute to fostering these values.

The study involved 48 undergraduate students and was conducted over a four-week period. Data were collected through questionnaires, structured observations, qualitative interviews, and content analysis of students' artistic works.

Research Results

The findings indicate substantial progress in both creative development and the formation of humanistic values:

1. **Survey results:** The proportion of students demonstrating a clear understanding of humanistic values increased from 42% to 78%.
2. **Observational data:** The percentage of students capable of independently completing complex creative tasks rose from 30% to 70%.
3. **Content analysis:**

-65% of artworks reflected themes such as human dignity, friendship, and cooperation;
-40% incorporated elements related to social justice and equality;
-All works demonstrated a consistent aesthetic quality and thoughtful use of color.

4.Interview findings: Students reported that visual arts activities helped them better understand children's emotions, foster collaborative skills, and adopt more humanistic teaching approaches.

Overall, the results confirm the significant pedagogical potential of visual arts activities in promoting humanistic values. The process of creative visual expression encourages students to reflect on personal experiences and critically engage with social relationships.

Conclusion

Based on the findings of this study, the following conclusions can be drawn:

1. Visual arts activities represent an effective means of fostering humanistic values among students.
2. Engagement in creative and aesthetic practices enhances students' pedagogical competencies.
3. The integration of visual arts into preschool teacher education programs is of critical importance.

4. The results support the broader implementation of visual arts activities in the professional preparation of future educators.

Recommendations. Visual arts should be systematically utilized as a tool for developing humanistic values;

-Human-centered artistic activities positively influence both personal and professional growth;

-The integration of visual arts into educational curricula for preschool teacher training is strongly recommended.

In accordance with the views and recommendations outlined above, it is essential to make extensive use of the potential of visual arts activities in fostering humanistic values among students specializing in preschool education.

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THEORETICAL FOUNDATIONS OF TEACHER ACTIVITY AND REFLECTION IN THE CONTEXT OF DIGITAL TRANSFORMATION

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Abstract. *This article analyzes the pedagogical and psychological foundations for developing teachers' reflective competence in the context of digital transformation. Reflection is considered as an integration of cognitive, regulatory, and communicative processes, and its role in enhancing professional effectiveness is substantiated. The digital educational environment requires teachers to continuously analyze their activities, evaluate pedagogical decisions, and apply flexible approaches. The study outlines theoretical foundations and practical ways of developing reflective competence and highlights its importance in improving the quality of education.*

Keywords: *digital transformation, reflective competence, pedagogical activity, reflection, professional development, quality of education, digital learning environment, pedagogical approaches.*

Introduction

At the global level, reflection is interpreted as a complex integration of cognitive, regulatory, and communicative processes. Its insufficient development is associated with an individual's inability to fully comprehend oneself and the external environment, to adequately assess one's own capabilities, and to consciously regulate one's behavior. International studies, including empirical research conducted in the United States, indicate that of self-regulation mechanisms is linked to increased aggression, higher rates of suicidal behavior, psychological instability, and decreased performance efficiency. In the context of digital transformation, the sharp growth of information flows and the increasing openness of pedagogical activity require a high level of reflective regulation from teachers, thereby making the development of reflective competence a crucial condition for professional stability and effectiveness.

In particular, Article 4 of the Law of the Republic of Uzbekistan "On Education" defines the main principles of state policy in the field of education as the priority of education, non-discrimination in education, ensuring equal access to education, the humanistic and democratic nature of education and upbringing, social protection of pedagogical staff, as well as the guarantee of openness and transparency in educational activities. These principles necessitate the rational use of modern pedagogical approaches, innovative technologies, and digital tools in the educational process, as well as the formation of a critical and reflective attitude of teachers toward their professional activities.

Furthermore, the Resolution of the President of the Republic of Uzbekistan dated August 14, 2018, No. PQ–3907 "On measures to raise the system of educating youth spiritually, morally and physically to a qualitatively new level" identifies as priority tasks the renewal of the content of education, enhancement of the prestige of the teaching profession, development of the professional

potential of pedagogical personnel, and the formation of their modern competencies, including reflective thinking and the ability to analyze their own activities. The emphasis placed in this document on organizing the educational process based on digital technologies and supporting the professional development of teachers further increases the relevance of improving teacher competencies in the context of digital transformation.

Today, the intensification of digital transformation processes in the education system requires teachers not only to master information and communication technologies but also to analyze their pedagogical activities, understand the challenges arising in the digital learning environment, and develop a reflective position aimed at solving them. Therefore, the development of teachers' reflective competence emerges as one of the key pedagogical factors in ensuring the quality of education under conditions of digital transformation.

Based on the aforementioned regulatory and legal documents, as well as current trends in educational development, the relevance of the research topic "Pedagogical Foundations for Developing Teachers' Reflective Competence in the Context of Digital Transformation" is substantiated. To further elaborate this relevance, it is necessary first to theoretically analyze the pedagogical interpretation of the concept of "digital transformation" and its significance within the education system.

In the current context of globalization and the rapid development of digital technologies, profound qualitative changes are occurring in all spheres of society, particularly in the education system. These processes necessitate the renewal of educational content, forms, and methods, as well as increasing the requirements placed on teachers' professional activities. In particular, within the structure of teachers' professional competencies, the importance of reflective competence is significantly increasing under conditions of digital transformation. Therefore, analyzing the concept of digital transformation from a pedagogical perspective and substantiating its significance in the education system constitutes a relevant scientific and pedagogical problem.

In scientific literature, the concept of "digital transformation" was initially widely used in the fields of economics and management; however, over time, its content has been extended to the field of education. In pedagogical terms, digital transformation is not limited merely to the introduction of information and communication technologies into the educational process; rather, it represents a complex and continuous process that involves a fundamental reconsideration of the content of education, didactic approaches, systems of pedagogical interaction, and the professional activities of teachers. This process requires teachers to adopt new ways of thinking, continuously analyze their activities, and adapt to the digital environment.

Digital transformation in the education system also significantly changes the role of the teacher. Instead of being a traditional transmitter of knowledge, the teacher is increasingly viewed as a designer of the learning process, a facilitator of students' independent learning activities, and a reflective practitioner. This shift underscores the importance of developing teachers' reflective competence as a key condition for ensuring the quality of education.

From this perspective, the effective functioning of the education system under conditions of digital transformation depends not only on the level of teachers' mastery of digital technologies but also on their ability to pedagogically analyze these technologies, to recognize strengths and weaknesses in their own professional practice, and to adopt a reflective position oriented toward continuous professional growth. Thus, раскрытие педагогической сущности цифровой трансформации and substantiating its significance within the education system constitute the theoretical foundation of this research.

Literature Review. An analysis of scientific literature indicates that the concept of "digital transformation" has been interpreted differently across various fields of science and, within the pedagogical context, acquires a specific and distinctive meaning. Initially, this concept was associated with technological modernization and the digitization of production and management processes; however, over time, its social, cultural, and educational dimensions have become independent objects of research. From a pedagogical perspective, digital transformation manifests as a complex process directly related to the renewal of the content, methodology, intersubject relations within the educational system, and the formation of a new model of teachers' professional activity.

Among foreign researchers, Klaus Schwab characterizes digital transformation as systemic changes associated with the deep integration of digital technologies into all spheres of society and professional activity. According to him, digital transformation not only modernizes technological infrastructure but also fundamentally reshapes human thinking patterns, professional practices, social relations, and mechanisms of self-awareness [1]. When applied to the field of education, this approach demonstrates that the teacher's role is evolving beyond the traditional function of knowledge transmission toward a more analytical, reflective, and innovative form of professional activity.

When applied to pedagogical practice, this perspective implies that the digital learning environment requires teachers to continuously reconsider their professional activities, analyze the effectiveness of pedagogical decisions, evaluate the didactic potential of digital tools used in the educational process, and determine directions for their own professional development. In this regard, digital transformation serves as a powerful catalyst for activating reflective mechanisms within teachers' professional practice.

One of the researchers who explored the pedagogical essence of digital transformation is Alexander Asmolov, who interprets modern education as a learner-centered, open, and reflection-based system. According to his view, within the digital environment, the teacher is no longer merely a source of ready-made knowledge but rather a subject who designs, manages, and reflectively analyzes the learning process [2]. This approach highlights reflective competence as a key factor in ensuring the quality of education.

The role of reflection in teachers' professional activity has been deeply examined by Viktor Slastyonin, who considers reflective competence as one of the primary indicators of professional maturity and growth. He emphasizes that reflection enables teachers to systematically analyze the goals, content, methods, and outcomes of their activities, reassess existing experience, and adapt to innovative changes [3]. Particularly in the context of digital transformation, this competence functions as a mechanism ensuring teachers' professional adaptability.

The interrelationship between digital transformation and reflection is further elaborated by Donald Schön, who conceptualizes the teacher as a "reflective practitioner." He argues that modern professional activity develops not solely through predefined knowledge and algorithms but through thinking, analysis, and situational decision-making within the process of action itself [4]. This concept further substantiates the necessity of developing teachers' reflective competence in a digital educational environment.

Among CIS scholars, Eduard Zeer links the professional development of teachers in a digital learning environment with a continuous process of reflection. In his view, while digital technologies can automate certain technical aspects of pedagogical activity, reflective thinking,

professional self-awareness, and self-development remain integral professional qualities of the teacher [5].

In the works of Uzbek scholars, issues related to the modernization and digitalization of education and the development of teachers' professional competencies are also considered as leading research directions. In particular, Nazar Muslimov evaluates the reflective approach in teacher training as a crucial condition for the effective implementation of pedagogical innovations, emphasizing that a teacher's ability to analyze their own activity directly contributes to improving the quality of education [6].

The analysis of the above-mentioned scientific approaches demonstrates that, in the context of digital transformation, the effectiveness of the education system is directly dependent on the teacher's reflective competence. This competence ensures that teachers can operate consciously, critically, flexibly, and creatively within the digital environment. Therefore, a deep scientific analysis of the pedagogical interpretation of digital transformation and the substantiation of its significance within the education system constitute one of the key theoretical objectives of this research.

Analysis and Results. Modern researchers analyzing the impact of digital transformation processes on the education system assess this phenomenon as a complex and multidimensional factor that necessitates the restructuring of pedagogical activity on a fundamentally new methodological basis, moving beyond traditional paradigms. Under conditions of digital transformation, the educational process is not only technologically updated, but the essence of pedagogical thinking, professional consciousness, and reflective activity also undergoes profound changes. In this study, particular attention is given to the interrelationship between digital technologies and teachers' reflective competence as a distinct scientific problem.

In particular, Neil Selwyn interprets digital technologies not merely as auxiliary or technical tools in education, but as significant socio-pedagogical phenomena that reshape pedagogical thinking, professional reflection, and the interactions among educational actors. According to his perspective, digital transformation renders the processes of analyzing teaching practice, critically evaluating pedagogical decisions, and making responsible professional choices more complex, yet richer in content [7]. Within this research, Selwyn's approach serves as an important theoretical foundation for substantiating reflective competence as an essential condition of functioning in a digital educational environment. This perspective scientifically justifies the necessity of a reflective orientation in teachers' professional activity within digital learning environments. In technology-enhanced education, the teacher operates not only as a transmitter of knowledge but also as a designer, monitor, and analyst of the learning process. This requires the ability to identify students' individual needs, evaluate the effectiveness of teaching strategies, and continuously conduct reflective analysis of one's professional outcomes. In this study, this position is recognized as a methodological basis for identifying the structural components of reflective competence.

The methodological foundations of teacher activity in the context of digital transformation are also explored by Michael Fullan, who emphasizes that digital innovations in education yield real pedagogical impact only when they are aligned with teachers' personal and professional transformation. According to him, the implementation of digital technologies must be integrated with teachers' reflective thinking, professional values, pedagogical beliefs, and active professional stance [8]. In this research, Fullan's concept supports the argument that developing reflective competence is a pedagogical necessity in the context of digital transformation.

Addressing the issue of pedagogical reflection, Lev Vygotsky indirectly substantiates reflection as an essential psychological mechanism of personality development. According to his cultural-historical theory, conscious human activity-including professional activity-develops through the processes of understanding, transforming, and internalizing social experience [9]. In this study, Vygotsky's ideas provide a theoretical foundation for explaining the psychological basis of teachers' reflective activity. In contemporary pedagogical research, reflective competence is considered an integrative quality within the system of teachers' professional competencies. In particular, Irina Zimnyaya defines reflective competence as a set of intellectual, personal, and professional abilities aimed at consciously evaluating, adjusting, and developing one's professional activity [10]. From our perspective, the digital educational environment creates favorable conditions for the development of this competence; however, without a targeted pedagogical approach and deliberate organization of reflective activity, it cannot be fully formed.

The issue of organizing teachers' reflective activity in a digital educational environment is also extensively addressed in the works of Andrey Verbitsky. Within the framework of contextual learning theory, he interprets reflection as a key mechanism through which teachers comprehend, reassess, and effectively apply their professional experience in real pedagogical situations [11]. In this study, this approach serves as an important methodological source for developing technologies aimed at enhancing reflective competence.

Conclusion. The analysis of the above-mentioned scientific perspectives demonstrates that, under conditions of digital transformation, the content of teachers' professional activity becomes increasingly complex, and reflective competence emerges as a leading professional quality. Although digital technologies create broad opportunities for the effective organization of the educational process, it is the teacher's reflective position that serves as the decisive factor in transforming these opportunities into real pedagogical outcomes.

Therefore, substantiating the theoretical foundations of teachers' reflective competence and developing its pedagogical mechanisms in the context of digital transformation should be considered one of the central scientific objectives of this research.

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METHODOLOGY FOR DEVELOPING PROFESSIONAL PEDAGOGICAL CULTURE BASED ON A CULTURAL-HUMANISTIC APPROACH

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Abstract. *This article examines the methodological foundations for developing professional pedagogical culture among future preschool educators through a cultural-humanistic approach. The study emphasizes the importance of communicative competence, pedagogical ethics, reflective thinking, creativity, tolerance, and professional image in the formation of pedagogical professionalism. Particular attention is devoted to innovative pedagogical methodologies, including case-study, reflective analysis, role-play, portfolio technology, and cooperative learning methods. The research was conducted among second- and third-year students of a pedagogical university using observation, questionnaires, pedagogical testing, reflective essays, and competence assessment criteria. The findings indicate that the implementation of cultural-humanistic methodologies significantly improved students' communicative culture, empathy, reflective competence, and professional ethics. The article concludes that the integration of humanistic pedagogical principles into teacher education contributes to the preparation of socially responsible, culturally competent, and professionally developed educators capable of meeting the demands of contemporary education.*

Keywords: *professional pedagogical culture, cultural-humanistic approach, communicative competence, pedagogical ethics, reflective analysis, empathy, tolerance, innovative pedagogical technologies, cooperative learning, role-play methodology, preschool education, reflective competence.*

Introduction

Global transformations in education have significantly changed the professional requirements imposed on educators. In contemporary pedagogical practice, professional competence alone is no longer sufficient; educators are also expected to possess a high level of pedagogical culture, ethical responsibility, communicative flexibility, and humanistic values. In this regard, the development of professional pedagogical culture among future preschool educators has become one of the most urgent issues in modern pedagogy. The increasing emphasis on personality-oriented education and humanistic pedagogy has strengthened the need for culturally sensitive and socially responsible educators. Today's preschool teacher is expected not only to provide knowledge but also to create an emotionally supportive environment based on empathy, tolerance, respect, and intercultural communication. However, pedagogical observations reveal that many future educators experience difficulties in professional communication, pedagogical ethics, and reflective self-assessment.

Approximately 46% of pedagogical university students demonstrated inadequate levels of pedagogical communication skills, and 58% of preschool teachers in practice reported a need for more professional ethics training, according to the findings of a 2024 pedagogical monitoring study. These indications show how important it is to put new approaches into practice with the goal

of enhancing professional pedagogical culture through cultural-humanistic principles. Recognizing human dignity, personal growth, intercultural communication, and collaborative pedagogical interaction are the main goals of the cultural-humanistic approach. This strategy fosters the growth of reflective thinking, professional values, and communicative skills in aspiring teachers. Thus, the professional preparation of prospective preschool teachers can be greatly enhanced by incorporating cultural-humanistic approaches into pedagogical instruction.

The success of educational activities is determined by a complex system of professional, ethical, communicative, and personal traits that make up professional pedagogical culture. This idea encompasses educational ethics, speech culture, communicative competence, reflective thinking, creativity, tolerance, and professional image in contemporary pedagogical science. The ability of educators to build morally sound and respectful interactions with students, parents, and coworkers is referred to as pedagogical ethics. Speech culture is a reflection of the teacher's capacity for effective, emotionally charged, and pedagogically sound communication. Communicative competence encompasses the emotional intelligence, conflict resolution, and interpersonal communication abilities required for educational engagement. Because it allows educators to assess their own pedagogical behaviour, pinpoint areas of weakness, and enhance professional performance, reflective thinking plays a crucial role in professional educational culture. While tolerance guarantees respect for cultural variety and individual variations among students, creativity fosters creative problem-solving and adaptable instructional decision-making. The writings of a number of eminent academics provide the theoretical foundation for the cultural-humanistic approach. Jan Amos Comnianus stressed the value of a natural, compassionate education that respects each child's individuality. Lev Vygotsky emphasized the importance of cultural context and social interaction for cognitive development. The self-actualization idea was created by Abraham Maslow, who maintained that education should promote psychological health and personal development. In a similar vein, Carl Rogers promoted student-centered learning based on compassion and unconditional positive regard. Abdulla Avloniy believed that morals, culture, and spirituality were the cornerstones of successful education and teacher professionalism in Uzbek pedagogy.

Methods

Therefore, personality-oriented education, empathy, intercultural communication, national values, and pedagogical cooperation are all integrated into the professional training of prospective educators through the cultural-humanistic approach.

The development of professional pedagogical culture requires the systematic implementation of innovative pedagogical methodologies that encourage reflective learning, cooperation, ethical responsibility, and communicative activity.

The research procedure made extensive use of the case-study methodology. Real-world educational scenarios involving humanistic and analytical decision-making were presented to the students. Participants examined the case “Strategies for Working with a Shy Child in Preschool Education,” for instance. Students looked at the child's psychological traits, recognized communication obstacles, suggested humane fixes, and critically assessed their choices. Students' pedagogical thinking, empathy, and problem-solving skills were greatly enhanced by the use of case-study techniques. Additionally, this approach inspired aspiring teachers to make the connection between theoretical understanding and practical pedagogy.

The development of students' professional awareness and self-evaluation was greatly aided by reflective analysis. Students performed reflective diaries and written analyses centred on topics

such as “How did I communicate during the lesson?” and “What pedagogical mistakes did I make?” following hands-on instruction and microteaching sessions. Students' capacity to critically assess their educational behaviour, strengthen communication techniques, and cultivate reflective competence was all improved by this practice. Professional self-regulation and emotional stability were also enhanced by reflective techniques.

“Teacher–Parent Communication,” “Teacher–Child Interaction,” and “Conflict Resolution Situations” were among the role-playing exercises designed to mimic real-world educational interactions. Students were able to practice communication techniques in emotionally charged settings through these exercises. The role-playing approach enhanced teaching ethics, emotional intelligence, tolerance, and communicative culture. Through constructive discourse, students gained confidence in their ability to voice professional ideas and resolve interpersonal conflicts.

In order to track students' professional development and accomplishments, portfolio technology was introduced. Lesson plans, reflective essays, creative projects, classroom observations, and self-evaluation reports were all included in each participant's unique pedagogical portfolio.

The portfolio concept enhanced reflective thinking and promoted ongoing professional development. Additionally, it allowed pupils to assess their own development and identify areas that needed improvement.

Activities in the classroom incorporated cooperative learning techniques including “Jigsaw” and “Think-Pair-Share.” These techniques encouraged students to work together, support one another, participate actively, and communicate with one another. The use of cooperative learning technology aided in the growth of intercultural communication proficiency, teamwork abilities, and humanistic interaction. During group projects, students showed greater levels of involvement and accountability.

The experimental research was conducted at a pedagogical university among second- and third-year students specializing in preschool education. A total of 60 students participated in the study, including 30 students in the control group and 30 students in the experimental group.

Several diagnostic methods were applied during the research process:

1. Observation method
2. Questionnaires
3. Pedagogical testing
4. Reflective essays
5. Competence assessment criteria

The diagnostic assessment focused on the following indicators:

- communicative culture;
- pedagogical ethics;
- empathy;
- reflective competence;
- tolerance;
- professional creativity.

At the initial stage of the experiment, the majority of students demonstrated insufficient levels of communicative competence and pedagogical reflection.

Results

Many participants experienced difficulties in maintaining professional dialogue, managing emotional interactions, and applying ethical principles in pedagogical situations.

Indicators	Before Experiment	After Experiment
Communicative Culture	42%	78%
Pedagogical Ethics	38%	74%
Empathy	45%	81%
Reflective Competence	36%	69%
Tolerance	41%	76%
Professional Creativity	40%	72%

The statistical results demonstrate that the cultural-humanistic approach positively influenced students' professional development.

Discussion

Compared to the control group, students in the experimental group showed higher levels of pedagogical communication, ethical responsibility, emotional intelligence, and reflective thinking.

The research findings confirm that the cultural-humanistic approach creates favorable pedagogical conditions for developing professional pedagogical culture among future preschool educators. Unlike traditional instructional methods focused primarily on theoretical knowledge, the proposed methodologies encourage emotional engagement, reflective analysis, collaborative learning, and value-oriented communication. The study also demonstrates that innovative pedagogical technologies can effectively strengthen students' professional identity and social responsibility. The integration of humanistic principles into pedagogical education contributes to the preparation of educators capable of establishing respectful, empathetic, and culturally sensitive relationships within educational environments. Furthermore, the implementation of reflective and cooperative methodologies helps future educators adapt more successfully to modern educational challenges characterized by multiculturalism, digitalization, and increasing social complexity.

Conclusion. The conducted research demonstrates that the development of professional pedagogical culture through a cultural-humanistic approach represents one of the essential directions in modern pedagogical education. The study confirms that professional pedagogical culture is a multidimensional phenomenon encompassing pedagogical ethics, communicative competence, reflective thinking, creativity, tolerance, and professional image. The implementation of innovative methodologies such as case-study, reflective analysis, role-play activities, portfolio technology, and cooperative learning significantly improved students' professional and personal competencies. Experimental results showed positive changes in communicative culture, empathy, pedagogical ethics, and reflective competence among future preschool educators. Furthermore, the integration of humanistic values into pedagogical education strengthened students' emotional intelligence, collaborative skills, and intercultural communication abilities. The statistical indicators obtained during the experimental process confirmed the effectiveness of the proposed methodologies in improving professional pedagogical culture. Therefore, the cultural-humanistic approach can be considered an effective pedagogical framework for preparing socially responsible, ethically competent, and professionally developed educators capable of adapting to contemporary educational challenges and multicultural learning environments.

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STRUCTURAL AND CONTENT COMPONENTS OF A COMPETENCY-ORIENTED METHODOLOGY FOR MEDICAL EDUCATION

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Abstract. *This article examines the structural and content components of a competency-oriented methodology designed to improve the quality of medical education. The study was conducted at Andijan State Medical Institute and focused on the systematic development of students' professional, clinical, communicative, digital, and reflective competencies. The article substantiates the methodological importance of integrating educational goals, clinically relevant content, interactive teaching technologies, digital learning tools, assessment mechanisms, and reflective feedback into a unified pedagogical system.*

The proposed methodology includes target, conceptual, content, procedural-technological, assessment-reflective, and result-oriented components. Each component is described in relation to its role in forming students' readiness for future professional medical activity. The results indicate that the competency-oriented approach supports the development of clinical reasoning, independent decision-making, practical application of theoretical knowledge, teamwork, and self-assessment skills. The article emphasizes that competency formation in medical education requires not only knowledge transmission, but also active learning, clinical contextualization, continuous feedback, and reflective analysis.

Keywords: *medical education, competency-based approach, structural components, content components, clinical reasoning, digital competence, professional competence.*

Introduction

Modern medical education is undergoing a significant transformation from knowledge-centered instruction to competency-oriented training. This shift is associated with the growing need to prepare future physicians not only to memorize biomedical information, but also to apply it in complex clinical, communicative, ethical, and digital contexts. Competency-based medical education emphasizes measurable learning outcomes, progressive development of professional abilities, continuous assessment, and readiness for real medical practice [1]. International frameworks such as CanMEDS describe the physician as a medical expert, communicator, collaborator, leader, health advocate, scholar, and professional, thereby showing that medical competence is a multidimensional construct [2]. The World Federation for Medical Education also emphasizes that educational standards should be adapted to local context while maintaining quality improvement in medical education [3].

In the context of higher medical education, the structural organization of methodology is particularly important. A competency-oriented methodology cannot be limited to a list of topics or learning objectives. It requires a systematic connection between educational goals, content selection, teaching technologies, clinical simulation, digital resources, assessment tools, and

reflective feedback. Harden's outcome-based model also supports the idea that the educational process should begin with a clear understanding of what kind of doctor the curriculum intends to produce [4]. Therefore, the structural and content components of methodology should be designed as an integrated pedagogical system rather than as separate instructional elements.

At Andijan State Medical Institute, the need to strengthen competency-oriented teaching is connected with the practical requirements of modern healthcare, the digitalization of education, and the increasing role of clinical reasoning in undergraduate medical training. Students must learn to connect theoretical disciplines with clinical cases, analyze patient-oriented situations, use digital platforms, interpret diagnostic information, and make evidence-based decisions. For this reason, the present study focuses on the development of a methodology that combines structural clarity with meaningful educational content.

The scientific relevance of the study lies in the fact that many competency-based models describe final outcomes, but do not always explain how these outcomes should be methodically structured within the educational process. This article therefore aims to identify and substantiate the main structural and content components of a methodology oriented toward developing competencies in medical education.

Materials and methods. The study was conducted at Andijan State Medical Institute during the 2024–2025 academic year and was designed as a pedagogical experimental study aimed at identifying, substantiating, and testing the structural and content components of a competency-oriented methodology in medical education. The research was based on the principles of competency-based medical education, outcome-oriented learning, clinical contextualization, active student participation, and reflective assessment [1, 2, 5]. The participants included undergraduate medical students who were conditionally divided into control and experimental groups. In the control group, the educational process was organized mainly through traditional explanatory, reproductive, and topic-centered teaching methods, while in the experimental group the proposed methodology was implemented through an integrated system of target, conceptual, content, procedural-technological, assessment-reflective, and result-oriented components.

The target component determined the expected professional, clinical, communicative, digital, and reflective competencies of students; the conceptual component relied on competency-based, integrative, activity-oriented, clinical-contextual, and reflective approaches; the content component included clinically significant theoretical material, interdisciplinary links, diagnostic situations, and case-based tasks; the procedural-technological component involved interactive lectures, problem-based learning, clinical case analysis, simulation elements, digital educational platforms, group discussions, and independent practical assignments [3, 4, 6].

The assessment-reflective component was organized through formative and summative evaluation methods, including written tests, oral questioning, clinical case interpretation, practical task performance, observation, self-assessment, peer feedback, and rubric-based evaluation. Particular attention was paid to students' ability to apply theoretical knowledge in clinically oriented situations, justify diagnostic and educational decisions, communicate effectively, use digital resources, and critically analyze their own learning progress [7, 8]. The effectiveness of the methodology was evaluated by comparing the initial and final levels of competency formation in both groups.

Quantitative data were obtained through diagnostic tests, questionnaires, and practical assignments, while qualitative data were collected through pedagogical observation, analysis of students' responses, reflective notes, and teacher feedback. The results were analyzed using

comparative, descriptive, and interpretative methods in order to determine the pedagogical value of the proposed methodology and its influence on the development of students' professional readiness for future medical practice [9, 10].

Results

The implementation of the proposed methodology showed that competency development in medical education depends on the internal connection between aims, content, teaching methods, assessment, and reflection. Students in the experimental group demonstrated more active participation in clinical discussions, better argumentation of diagnostic decisions, and higher motivation to use digital educational resources.

Table 1. Structural and content components of the proposed methodology

Component	Main function	Educational content	Expected result
Target component	Defines the aim and expected competencies	Professional, clinical, digital, communicative and reflective goals	Clear orientation toward future medical activity
Conceptual component	Provides theoretical-methodological basis	Competency-based, integrative, activity-based and reflective approaches	Scientifically grounded teaching strategy
Content component	Selects and organizes learning material	Clinical cases, interdisciplinary content, diagnostic situations	Meaningful and practice-oriented knowledge
Procedural-technological component	Organizes teaching and learning process	Case-based learning, simulation, digital tools, group work	Active student participation
Assessment-reflective component	Measures and corrects learning outcomes	Tests, rubrics, self-assessment, feedback	Objective and formative evaluation
Result-oriented component	Determines final competency formation	Professional readiness indicators	Improved clinical and professional competence

The diagnostic results showed positive changes in the experimental group. Students became more confident in explaining clinical situations, connecting theoretical information with practice, and evaluating their own learning progress.

Table 2. Comparative growth of competency indicators

Competency indicator	Control group growth	Experimental group growth
Theoretical knowledge application	12.4%	24.8%
Clinical reasoning	10.6%	28.3%
Digital learning competence	9.8%	25.7%
Communication and teamwork	11.2%	23.6%
Reflective self-assessment	8.9%	27.1%

The highest growth was observed in clinical reasoning and reflective self-assessment. This indicates that the methodology helped students not only acquire knowledge, but also understand how and why they apply this knowledge in medical situations.

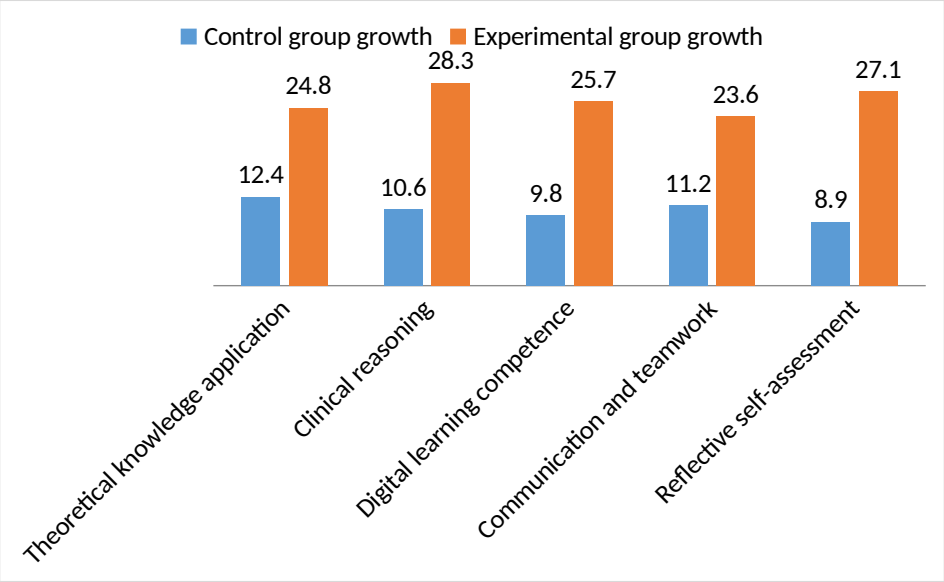


Fig1. Comparative growth of competency indicators

Discussion. The results of the study confirm that competency-oriented methodology should be understood as a complex pedagogical system. In medical education, competencies cannot be formed through isolated lectures or mechanical memorization. They require continuous integration of theory, practice, communication, clinical analysis, digital literacy, and reflection.

The target component plays a guiding role because it defines what kind of professional qualities should be formed in students. Without clearly formulated outcomes, teaching may remain fragmented and content-heavy. The conceptual component ensures that the methodology has a scientific basis and is not reduced to a collection of teaching techniques. The content component is especially important in medical education. Medical knowledge becomes professionally meaningful only when students understand its clinical value. Therefore, theoretical material should be connected with patient-oriented cases, diagnostic algorithms, laboratory data, ethical questions, and interdisciplinary explanations. The procedural-technological component creates conditions for active learning. Case-based learning, simulation tasks, and digital resources allow students to move from passive perception to analytical and practical activity. This is particularly relevant in medical education because future physicians must learn to make decisions in uncertain and dynamic clinical situations. The assessment-reflective component is one of the key elements of competency formation. Traditional assessment often measures only knowledge reproduction, while competency-based assessment evaluates application, reasoning, communication, independence, and professional growth. Reflection helps students become aware of their learning process and develop responsibility for their professional development.

The study also showed that digital tools should not be used only as technical additions. They must be methodically integrated into the educational process. Digital platforms, electronic tests, virtual cases, and learning analytics can support individualized learning, formative assessment, and timely feedback. Overall, the methodology tested at Andijan State Medical Institute demonstrated that competency development becomes more effective when all structural and content components are logically connected and directed toward practical medical activity.

Conclusion. The study substantiated the structural and content components of a methodology oriented toward developing competencies in medical education. The proposed model includes target, conceptual, content, procedural-technological, assessment-reflective, and result-oriented components. Each component performs a specific pedagogical function, but their

effectiveness depends on systematic integration. The research conducted at Andijan State Medical Institute showed that the proposed methodology contributes to the development of students' clinical reasoning, digital competence, communication skills, reflective thinking, and ability to apply theoretical knowledge in practice. The methodology may be recommended for improving competency-based teaching in medical higher education institutions.

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USING INNOVATIVE PEDAGOGICAL TECHNOLOGIES AND THE STEM INTEGRATION MODEL IN TEACHING MICROBIOLOGY

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Abstract. *This article examines the pedagogical possibilities of using innovative educational technologies and the STEM integration model in teaching microbiology at a medical higher education institution. The study was developed in the context of Andijan State Medical Institute and focuses on improving students' microbiological thinking, laboratory-diagnostic competence, clinical reasoning, digital literacy, and readiness for evidence-based decision-making. The proposed methodology combines problem-based learning, case analysis, virtual and simulation-based laboratories, digital microscopy, interactive platforms, formative assessment, learning analytics, and project-oriented STEM tasks. Within the STEM model, scientific microbiological content is connected with technological tools, engineering-style diagnostic design, and mathematical interpretation of laboratory and epidemiological data. The article substantiates a structural model consisting of target, conceptual, STEM-content, procedural-technological, assessment-analytical, reflective, and result-oriented components. The results indicate that systematic integration of innovative pedagogical technologies with STEM tasks supports active learning, strengthens the connection between theory and clinical practice, and develops students' ability to analyze microbial processes through interdisciplinary reasoning. The article concludes that STEM-integrated microbiology teaching can serve as an effective methodological approach for modern medical education when it is implemented as a coherent pedagogical system rather than as a set of separate digital tools.*

Keywords: *microbiology education, innovative pedagogical technologies, STEM integration, medical education, laboratory-diagnostic competence, digital microscopy, case-based learning, clinical reasoning.*

Introduction

Modern medical education is increasingly oriented toward the formation of competencies that allow future physicians to interpret biomedical information, apply laboratory findings in clinical contexts, and make reasoned decisions under conditions of uncertainty. Microbiology has a special place in this process because it connects fundamental biomedical knowledge with diagnostics, infection control, antimicrobial therapy, epidemiological thinking, and public health. However, traditional topic-centered teaching does not always provide enough conditions for students to understand microbial processes as dynamic, clinically significant, and technologically measurable phenomena [1].

The rapid development of digital education, simulation tools, virtual laboratories, electronic assessment systems, and artificial intelligence-supported learning analytics has created new opportunities for improving microbiology teaching. Innovative pedagogical technologies make it possible to organize learning not only as the transmission of information, but also as an

active process of analysis, experimentation, interpretation, communication, and reflection. For medical students, this means that microbiology should be taught through clinical cases, laboratory algorithms, digital visualizations, epidemiological models, and interdisciplinary problem-solving tasks [2, 3].

STEM integration offers a strong methodological foundation for such transformation. In microbiology education, the science component includes microbial morphology, physiology, genetics, immunological interactions, pathogenicity, and antimicrobial resistance. The technology component involves digital microscopy, learning management systems, virtual simulations, databases, electronic tests, and multimedia resources. The engineering component appears in designing diagnostic pathways, constructing laboratory workflows, modeling infection control strategies, and solving practical problems. The mathematics component is realized through interpretation of microbial growth curves, statistical analysis of sensitivity results, epidemiological indicators, risk levels, and quantitative evaluation of learning outcomes [4, 5].

The relevance of this research is determined by the need to move from reproductive memorization of microbiological facts to interdisciplinary and practice-oriented learning. A future physician should be able to explain why a microorganism causes disease, how laboratory evidence supports diagnosis, what technological tools can be used to identify pathogens, and how numerical results can influence clinical decisions. Therefore, microbiology teaching should create a bridge between basic science, digital technologies, laboratory diagnostics, and clinical reasoning [6].

At Andijan State Medical Institute, the improvement of microbiology teaching is connected with the broader modernization of medical education and the introduction of digital pedagogical tools. The present article aims to substantiate a methodology for using innovative pedagogical technologies and the STEM integration model in teaching microbiology and to determine its structural and content components, procedural mechanisms, and expected educational results.

Materials and Methods

The research was organized as a pedagogical and methodological study at Andijan State Medical Institute during the 2024-2025 academic year. The study focused on students studying microbiology, virology, and immunology within the basic medical curriculum. The methodological design was based on competency-based education, STEM-integrated learning, problem-based instruction, activity-oriented pedagogy, clinical contextualization, and reflective assessment. The central idea of the study was that microbiology teaching becomes more effective when scientific content is systematically connected with digital technologies, diagnostic design, quantitative analysis, and clinically meaningful tasks [7, 8].

The experimental methodology was built around seven interrelated components: target, conceptual, STEM-content, procedural-technological, assessment-analytical, reflective, and result-oriented components. The target component defined the expected competencies of students: understanding microbial processes, interpreting laboratory data, applying digital tools, designing diagnostic reasoning pathways, communicating results, and evaluating their own learning progress. The conceptual component relied on innovative pedagogy, interdisciplinary integration, student-centered learning, case-based instruction, clinical orientation, and the principle of continuity between theoretical and practical learning.

The STEM-content component reorganized microbiology topics according to interdisciplinary logic. For example, the topic of bacterial growth was studied through biological mechanisms, technological visualization, engineering-style design of cultivation conditions, and mathematical interpretation of growth curves. Antimicrobial susceptibility testing was taught

through microbiological theory, digital interpretation of laboratory images, diagnostic algorithm construction, and statistical comparison of sensitivity patterns. Virology and immunology topics were connected with clinical cases, epidemiological indicators, and digital decision-support tasks.

The procedural-technological component included interactive lectures, small-group discussions, problem-based learning, case-based analysis, virtual laboratory exercises, digital microscopy demonstrations, online tests, multimedia scenarios, simulation tasks, and STEM mini-projects. Students were encouraged to solve tasks such as identifying possible pathogens from clinical descriptions, choosing appropriate laboratory methods, interpreting Gram-staining or culture results, explaining antimicrobial resistance patterns, and constructing infection control recommendations. In this process, the teacher acted as a facilitator who guided students toward evidence-based reasoning rather than simply providing ready-made answers.

The assessment-analytical component was organized through diagnostic tests, rubric-based practical tasks, clinical case interpretation, oral questioning, electronic quizzes, peer feedback, self-assessment, and analysis of individual learning progress. Quantitative indicators were used to compare the growth of selected competencies in control and experimental groups. Qualitative data were collected through observation, students' reflective notes, teacher feedback, and analysis of practical responses. The effectiveness of the methodology was evaluated according to students' ability to apply microbiological knowledge in clinical situations, use digital resources, interpret laboratory data, cooperate in a group, and justify diagnostic decisions [9, 10].

Results

The implementation of innovative pedagogical technologies and the STEM integration model showed that microbiology teaching becomes more meaningful when students work with interdisciplinary tasks that connect theory, laboratory practice, digital technologies, and clinical interpretation. Students in the experimental group demonstrated more active participation during microbiological case analysis, better ability to interpret laboratory indicators, and stronger motivation to use digital educational resources. The general structure of the proposed methodology is presented in Table 1.

Table 1. Structural components of the STEM-integrated microbiology teaching methodology

Component	**Pedagogical function**	**Microbiology-related content**	**Expected educational result**
Target component	Defines learning outcomes and competency indicators	Microbiological thinking, laboratory-diagnostic competence, digital competence, clinical reasoning	Clear orientation toward professional medical activity
Conceptual component	Provides scientific and methodological basis	Competency-based, STEM-integrated, clinical-contextual, reflective approaches	Coherent strategy for interdisciplinary teaching
STEM-content component	Connects the four STEM dimensions within microbiology	Microbial processes, digital microscopy, diagnostic design, quantitative interpretation	Practice-oriented and interdisciplinary knowledge

Procedural-technological component	Organizes active learning and student participation	Case-based learning, virtual lab, simulation, group project, digital platform	Higher engagement and analytical learning activity
Assessment-analytical component	Measures and corrects learning outcomes	Tests, rubrics, case interpretation, digital analytics, peer feedback	Objective evaluation and continuous improvement
Reflective component	Develops self-assessment and professional awareness	Reflective diaries, discussion of mistakes, learning progress analysis	Responsibility for learning and professional growth
Result-oriented component	Determines final competency formation	Readiness to interpret laboratory evidence and make justified decisions	Improved microbiological and clinical competence

The proposed model did not treat STEM as an additional topic, but as a way of organizing microbiology content. Each microbiology theme was reconstructed through scientific explanation, digital or technological support, engineering-style problem design, and mathematical interpretation. This created a more active and clinically oriented learning environment. Table 2 shows how innovative pedagogical technologies were aligned with microbiology learning outcomes.

Table 2. Innovative pedagogical technologies and their methodological role in microbiology education

Innovative technology	**Implementation in microbiology teaching**	**Student activity**	**Competency developed**
Problem-based learning	Analysis of infection-related clinical situations	Identifies pathogen, explains pathogenesis, suggests diagnostic steps	Clinical and microbiological reasoning
Case-based learning	Work with patient-oriented microbiology scenarios	Interprets symptoms, laboratory data, and risk factors	Application of theoretical knowledge
Virtual laboratory	Simulation of staining, cultivation, PCR, ELISA, or antibiotic sensitivity testing	Chooses methods and interprets virtual results	Laboratory-diagnostic competence
Digital microscopy and multimedia	Use of images, video fragments, and digital slides	Recognizes microbial morphology and compares diagnostic features	Visual diagnostic literacy
STEM mini-projects	Design of infection control plan or diagnostic algorithm	Creates solution, calculates indicators, presents findings	Project competence and teamwork
Learning analytics	Monitoring of test results and practical	Analyzes mistakes and plans self-	Reflective self-assessment

	performance	improvement	

Comparative diagnostic results demonstrated positive dynamics in the experimental group. The most visible growth was observed in microbiological reasoning, laboratory-diagnostic competence, STEM project skills, and reflective self-assessment. These results suggest that interdisciplinary and technologically supported learning helps students understand the practical value of microbiology and apply knowledge in problem-solving situations.

Table 3. Comparative growth of competency indicators in control and experimental groups

Competency indicator	**Control group growth**	**Experimental group growth**
Theoretical knowledge application	11.8%	23.9%
Microbiological reasoning	10.9%	29.4%
Laboratory-diagnostic competence	12.3%	27.6%
Digital learning competence	9.7%	25.8%
STEM project skills	8.6%	26.2%
Reflective self-assessment	9.4%	27.9%

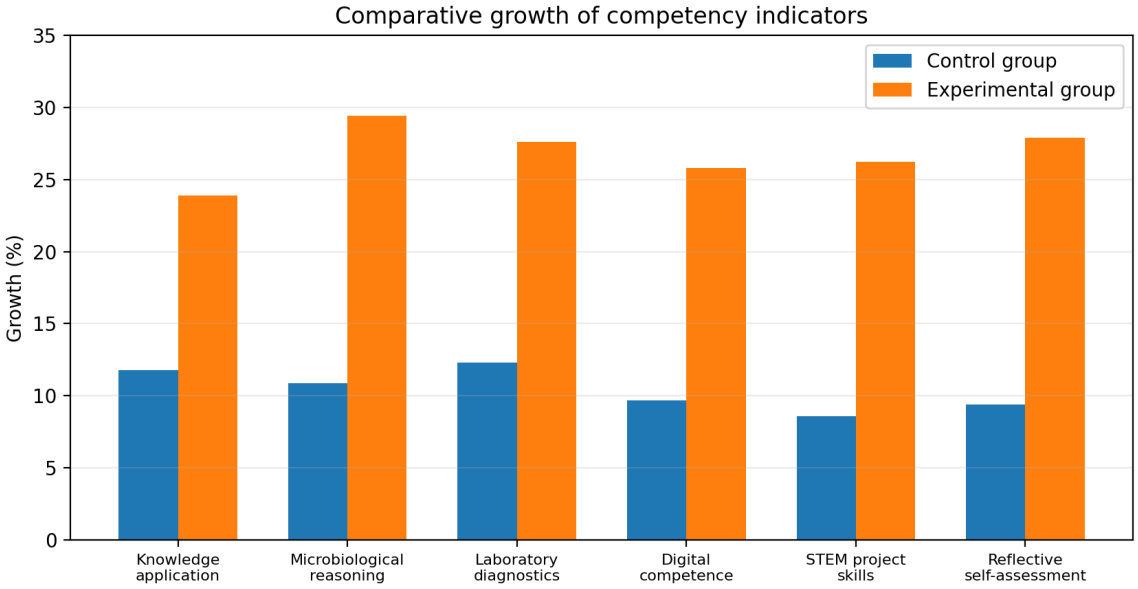


Figure 1. Comparative growth of competency indicators in STEM-integrated microbiology teaching

The experimental group showed stronger improvement because the educational process was structured around active interpretation rather than passive memorization. Students learned to connect microbial morphology with pathogenesis, laboratory methods with clinical diagnosis, and quantitative results with decision-making. The STEM model also encouraged students to see microbiology as a field where biological knowledge is inseparable from technology, diagnostic design, and data-based reasoning.

Discussion

The results of the study confirm that innovative pedagogical technologies can significantly enrich microbiology teaching when they are methodologically integrated rather than mechanically

added to traditional lectures. A digital presentation or online test alone does not make learning innovative. Innovation becomes pedagogically meaningful when it changes the structure of student activity: learners begin to analyze, compare, design, interpret, explain, and reflect. In this regard, STEM integration creates an effective framework for organizing microbiology as an interdisciplinary and practice-oriented subject.

The science dimension of the model helps students understand the biological essence of microorganisms, their structure, metabolism, genetic variability, pathogenic mechanisms, and interaction with the immune system. However, scientific knowledge becomes professionally useful only when students can apply it to diagnostic and clinical situations. Therefore, scientific explanation should be accompanied by clinical examples, laboratory cases, and problem-based questions.

The technology dimension is especially relevant for modern microbiology education. Digital microscopy, virtual laboratory tasks, multimedia atlases, electronic tests, and learning analytics help visualize invisible microbial processes and support individualized learning. These tools also allow teachers to identify gaps in students' understanding and provide timely feedback. At the same time, technology should not replace teacher guidance or real laboratory training; it should strengthen preparation, interpretation, and reflective analysis.

The engineering dimension is expressed in the design of diagnostic pathways and practical solutions. For example, students may be asked to construct an algorithm for identifying a causative agent, plan the sequence of laboratory tests, design an infection prevention strategy, or model the steps of antimicrobial susceptibility interpretation. Such tasks form procedural thinking and help students understand that medical diagnostics requires structured decision-making.

The mathematics dimension develops the ability to interpret quantitative information. Microbiology contains many numerical indicators: colony counts, dilution coefficients, growth curves, zone diameters in antimicrobial susceptibility testing, sensitivity and specificity values, epidemiological incidence, prevalence, and risk indicators. When students work with these values, they learn to justify decisions through evidence and not only through descriptive knowledge.

The study also demonstrated the importance of reflective assessment. Students who analyzed their mistakes after tests, compared their answers with rubrics, and discussed diagnostic reasoning in groups showed better awareness of their learning progress. Reflection is essential for medical education because professional competence develops not only through knowledge acquisition, but also through understanding how knowledge is used, why errors occur, and how future performance can be improved.

Thus, the STEM-integrated methodology for teaching microbiology should be understood as a complete pedagogical system. Its effectiveness depends on the logical connection between learning outcomes, microbiology content, innovative technologies, interdisciplinary tasks, formative assessment, and reflective feedback. When these elements function together, students acquire not only theoretical knowledge, but also the ability to apply microbiology in laboratory and clinical contexts.

Conclusion

The study substantiated the methodological value of using innovative pedagogical technologies and the STEM integration model in teaching microbiology. The proposed methodology includes target, conceptual, STEM-content, procedural-technological, assessment-analytical, reflective, and result-oriented components. Each component performs a specific function, but the effectiveness of the model depends on their systematic integration. The

implementation of the methodology at Andijan State Medical Institute showed that STEM-integrated microbiology teaching supports the development of microbiological reasoning, laboratory-diagnostic competence, digital literacy, project activity, teamwork, and reflective self-assessment. The model may be recommended for improving the quality of microbiology education in medical higher education institutions, especially in conditions where students must connect basic biomedical knowledge with clinical diagnostics, digital technologies, and evidence-based decision-making.

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TEACHERS' READINESS FOR INTERNATIONAL LARGE-SCALE ASSESSMENTS: EVIDENCE FROM PRIMARY SCHOOLS IN UZBEKISTAN

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Abstract. *This study investigates the instructional readiness of primary school teachers in Uzbekistan with respect to the Progress in International Reading Literacy Study (PIRLS). Using a descriptive survey design, data were collected from 37 fourth-grade teachers across three regions: Tashkent city (n=15, 40.5%), Samarkand region (n=14, 37.8%), and Namangan region (n=7, 18.9%). Findings reveal that 86.5% of teachers prioritise text comprehension over decoding as their main instructional goal. However, a clear cognitive demand gradient was identified: while lower-order retrieval tasks are consistently used (73.0% always), higher-order evaluative tasks aligned with PIRLS Levels 3–4 are used regularly by only 62.2% of respondents. Additionally, 18.9% of teachers rely predominantly on literary texts, potentially underexposing students to the informational reading demands of PIRLS. Key systemic barriers include time constraints (59.5%), low student motivation (48.6%), and perception of official recommendations as overly idealistic (45.9%). The study provides the first empirical survey-based investigation of teacher readiness for PIRLS in Uzbekistan and proposes recommendations for teacher education reform.*

Keywords: *PIRLS, teacher readiness, reading literacy, primary education, large-scale assessment, Uzbekistan, instructional practice, professional development.*

Introduction. Improving the quality of education has become a priority for many countries. International Large-Scale Assessments (ILSAs) such as the Progress in International Reading Literacy Study (PIRLS) provide a systematic mechanism for benchmarking student achievement and informing educational policy. PIRLS, conducted every five years by the International Association for the Evaluation of Educational Achievement (IEA), measures fourth-grade students' reading comprehension across literary and informational text types, using a four-level cognitive demand framework: retrieving explicit information, making straightforward inferences, interpreting and integrating ideas, and evaluating and critiquing content (Mullis & Martin, 2019). Uzbekistan participated in PIRLS for the first time in 2021, marking a significant step in the country's engagement with international educational standards. Alongside this, Uzbekistan's debut in PISA 2022 revealed that student reading literacy scores remained substantially below international averages, raising critical questions about instructional preparedness. In this context, the teacher occupies the most proximal position in students' learning development and is, therefore, central to any reform aimed at improving ILSA outcomes (Leino, Nissinen, & Sirén, 2022). While a growing body of research addresses student-level PIRLS outcomes and methodological aspects of PIRLS preparation in Uzbekistan (Qorayev & Allayorova, 2021; Shodmonqulova, 2022), survey-based investigations of teachers' instructional readiness — that is, the degree to which their actual classroom practices align with PIRLS cognitive demands — remain scarce. The present study addresses this gap by examining the

instructional orientations, methods, and perceived barriers of primary school teachers in relation to PIRLS requirements.

The study is guided by four research questions: (1) What instructional orientations and methods do primary school teachers use in reading lessons? (2) How consistently do teachers employ tasks aligned with PIRLS cognitive demand levels (L1–L4)? (3) What text types and assessment practices do teachers use? (4) What systemic barriers prevent effective alignment of instruction with PIRLS demands?

Literature Review. PIRLS assesses two primary reading purposes — reading for literary experience and reading to acquire and use information — each evaluated across four cognitive levels. This framework reflects a constructive and interactive view of reading in which students actively construct meaning from texts (Shodmonqulova, 2022). National policy in Uzbekistan has formalised participation in such assessments through Presidential Decree PF-5712 (2019), which set a target of achieving top-30 PISA ranking by 2030, and Government Resolution No. 997 (2018), which institutionalised participation in international assessment programmes.

Teacher quality is a well-established predictor of student reading achievement. Leino, Nissinen, and Sirén (2022), analysing PIRLS 2016 data from four Nordic countries (n=923 teachers, n=17,161 students), found significant associations between instructional quality — including cognitive activation and teacher support — and student reading outcomes. However, a fundamental distinction in the literature separates espoused beliefs from enacted practices (Fang, 1996; Borg, 2003): teachers may report comprehension-oriented goals while delivering predominantly recall-based instruction. Hattie (2009), synthesising over 800 meta-analyses, found that factual recall questioning remains the most prevalent form of classroom discourse globally, with higher-order tasks used comparatively rarely. In the Uzbek context, the 2022–2023 educational reform introduced "Reading Literacy" as an independent subject in primary schools, signalling institutional recognition of the need to develop comprehension-based reading skills. Qorayev and Allayorova (2021) highlighted the importance of aligning instructional practice with international assessment frameworks, while noting persistent challenges in translating policy intent into classroom reality.

Methods. A descriptive survey design was employed (Creswell, 2014). An electronic questionnaire was administered via Google Forms to primary school teachers across three regions of Uzbekistan: Tashkent city, Samarkand region, and Namangan region. The instrument comprised 16 items covering four dimensions: (1) teacher demographic profile; (2) instructional orientation and methods; (3) practices aligned with PIRLS cognitive demand levels; and (4) text type use, written response assessment, and perceived barriers. Purposive sampling was used to recruit fourth-grade teachers. Of 42 teachers invited, 37 (88.1%) completed the survey fully. Data were analysed using frequency analysis (absolute counts and percentages). For multiple-response items, each option was counted independently, with percentages calculated relative to the total sample (n=37). Open-ended responses were analysed using content analysis to identify recurring themes. The study adhered to ethical principles of informed consent, anonymity, and voluntary participation.

Results. Participant profile. The sample comprised 37 primary school teachers: Tashkent city (n=15, 40.5%), Samarkand region (n=14, 37.8%), and Namangan region (n=7, 18.9%). The majority were aged 36–45 (48.6%) or 46–55 (29.7%). In terms of qualification category, 45.9% held second-category status, 24.3% first-category, 18.9% the highest category, and 10.8%

specialist status. Teaching experience was predominantly substantial: 40.5% had 21 or more years, 18.9% had 16–20 years, 18.9% had 11–15 years, and 16.2% had 6–10 years (Table 1).

Table 1. Participant demographics (n=37)

Characteristic	Category	n	%
Region	Tashkent city	15	40.5%
	Samarkand region	14	37.8%
	Namangan region	7	18.9%
	Tashkent region	1	2.7%
Age	26–35	4	10.8%
	36–45	18	48.6%
	46–55	11	29.7%
	56 and above	4	10.8%
Qualification	2nd category	17	45.9%
	1st category	9	24.3%
	Highest category	7	18.9%
	Specialist	4	10.8%
Experience	1–5 years	2	5.4%
	6–10 years	6	16.2%
	11–15 years	7	18.9%
	16–20 years	7	18.9%
	21+ years	15	40.5%

Note. Percentages may not sum to 100% due to rounding.

Instructional orientation and methods. When asked about their primary instructional focus, 86.5% (n=32) of teachers reported prioritising text comprehension and critical thinking, while 13.5% (n=5) prioritised fluent and accurate decoding. Regarding the use of innovative methods, 56.8% (n=21) reported regular use and 32.4% (n=12) occasional use; open responses identified specific strategies including the 5H method, Jamburger, BBB method, and Bankomat method. The most frequently cited teaching methods (multiple responses permitted) were group discussion (70.3%, n=26), text-based question-and-answer (59.5%, n=22), shared reading (48.6%, n=18), independent reading (37.8%, n=14), and reading aloud (29.7%, n=11). Key literacy skills emphasised included creative thinking (81.1%, n=30), text comprehension (78.4%, n=29), vocabulary development (51.4%, n=19), reading speed (40.5%, n=15), and written expression (32.4%, n=12).

Table 2. Teaching methods and literacy skills (multiple responses, n=37)

Item	Response	n	%
Teaching methods	Group discussion	26	70.3%

Item	Response	n	%
	Text Q&A	22	59.5%
	Shared reading	18	48.6%
	Independent reading	14	37.8%
	Reading aloud	11	29.7%
Literacy skills	Creative thinking	30	81.1%
	Text comprehension	29	78.4%
	Vocabulary development	19	51.4%
	Reading speed	15	40.5%
	Written expression	12	32.4%

Note. Percentages exceed 100% as multiple responses were permitted.

PIRLS cognitive demand alignment. Three items assessed practices aligned with the three main PIRLS cognitive demand levels. For explicit information retrieval (PIRLS Level 1), 73.0% (n=27) reported always using such questions, while 27.0% (n=10) reported doing so only sometimes. For inferential tasks (PIRLS Level 2), 89.2% (n=33) affirmed use, with 10.8% (n=4) reporting partial use. Caution is warranted in interpreting this figure, as the survey did not define 'inference' operationally. For evaluating authorial perspective (PIRLS Levels 3–4), 62.2% (n=23) reported regular use, 32.4% (n=12) occasional use, and 5.4% (n=2) rare use — meaning 37.8% did not regularly employ the highest cognitive demand tasks (Table 3).

Table 3. PIRLS cognitive demand practices (n=37)

PIRLS Level	Question	Response	n	%
L1: Retrieve	Q12 – Explicit info	Always	27	73.0%
		Sometimes	10	27.0%
L2: Infer	Q13 – Inference tasks	Yes	33	89.2%
		Partial	4	10.8%
L3–4: Evaluate	Q14 – Author perspective	Regularly	23	62.2%
		Sometimes	12	32.4%
		Rarely	2	5.4%

Note. 37.8% of teachers do not regularly use the highest cognitive demand tasks.

Text types and written response assessment. Regarding text type use, 78.4% (n=29) of teachers reported using literary and informational texts in equal measure, consistent with PIRLS's balanced framework. However, 18.9% (n=7) reported relying predominantly on literary texts, potentially underexposing students to informational reading demands. Concerning the assessment of written constructed responses, 56.8% (n=21) found this moderately difficult, 37.8% (n=14)

found it not difficult, and 5.4% (n=2) found it very difficult — meaning 62.2% found written response assessment at least moderately challenging.

Barriers and theory–practice gaps. The most frequently cited instructional barriers (multiple responses permitted) were time constraints (59.5%, n=22), low student reading motivation (48.6%, n=18), and student text comprehension difficulties (27.0%, n=10). Regarding gaps between theoretical recommendations and classroom practice, 45.9% (n=17) reported that official recommendations are too idealistic to implement, 27.0% (n=10) stated that student levels do not match theoretical expectations, and 21.6% (n=8) cited insufficient teaching resources (Table 4).

Table 4. Instructional barriers and theory–practice gaps (multiple responses, n=37)

Item	Barrier / Gap	n	%
Barriers	Time constraints	22	59.5%
	Low student motivation	18	48.6%
	Text comprehension difficulties	10	27.0%
	Classroom management	2	5.4%
Theory–practice gaps	Recommendations too idealistic	17	45.9%
	Student levels don't match theory	10	27.0%
	Insufficient resources	8	21.6%
	No gap reported	1	2.7%

Note. Percentages exceed 100% as multiple responses were permitted.

Discussion. The findings reveal a complex picture of instructional readiness. The strong comprehension orientation reported by 86.5% of teachers and the predominance of discussion-based methods are encouraging from a PIRLS perspective. However, the study identifies a clear cognitive demand gradient: task frequency declines as cognitive demand increases, with L3–4 evaluative tasks used regularly by only 62.2% of respondents. This pattern is consistent with Hattie's (2009) finding that higher-order tasks remain underrepresented in global classroom practice, and directly affects students' capacity to reach PIRLS's upper benchmark levels (Mullis et al., 2023). The inferential task result (89.2%) warrants interpretive caution. International research on teacher knowledge of reading consistently shows that teachers without specialist literacy training may conflate simple interpretive questions with genuinely inferential tasks (Fang, 1996). The survey's lack of an operational definition for 'inference' limits the reliability of this figure. The finding that 18.9% of teachers rely predominantly on literary texts constitutes a structural risk, given that PIRLS assesses literary and informational reading in approximately equal proportion (Mullis & Martin, 2019). Informational reading requires distinct skills — understanding expository text structures, domain vocabulary, and information synthesis — that demand dedicated instructional attention. The most structurally significant finding is that 45.9% of teachers perceive official pedagogical recommendations as too idealistic to implement in practice. This points to a fundamental disconnect between policy intent and classroom reality that is characteristic of

educational reform processes in post-transition contexts (Fang, 1996). Addressing this gap requires not only professional development but systemic investment in time, resources, and school-based collaborative learning structures.

Conclusion. This study provides the first survey-based empirical investigation of primary school teachers' instructional readiness for PIRLS in Uzbekistan. Key findings indicate: (1) teachers hold broadly positive comprehension-oriented beliefs, but higher-order evaluative tasks are not regularly used by 37.8%; (2) 18.9% of teachers underexpose students to informational texts; (3) 62.2% find written constructed response assessment at least moderately difficult; and (4) systemic barriers — particularly time constraints (59.5%) and the perceived idealism of official recommendations (45.9%) — impede PIRLS-aligned practice. These findings carry direct implications for Uzbekistan's educational reform agenda. First, teacher education programmes should explicitly integrate PIRLS cognitive demand frameworks. Second, targeted in-service professional development focused on higher-order comprehension instruction and written response assessment is urgently needed. Third, the curriculum should ensure balanced exposure to literary and informational texts. Fourth, school-based professional learning communities would help bridge the gap between policy recommendations and daily classroom practice. Fifth, PIRLS results should be used diagnostically at school and district level rather than merely as ranking data. Future research should address the limitations of the present study by employing larger, nationally representative samples, incorporating classroom observation alongside self-report data, and conducting longitudinal evaluation of professional development interventions.

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THE FUNCTION OF CONTEMPORARY EDUCATIONAL TECHNOLOGIES IN FUTURE TEACHERS' DEVELOPMENT OF PEDAGOGICAL SKILLS

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Abstract. *The study intends to investigate how modern pedagogical technology can improve students' teaching skills in pedagogical specializations and to logically defend its use in higher education. It also focuses on evaluating how well-versed future educators are in contemporary pedagogical strategies and how prepared they are to apply them in their professional practice. A qualitative research design was used in this study, which was based on the examination of theoretical literature written by Ukrainian and foreign academics. Systematization, generalization, and comparative study of pertinent scientific sources were all part of the research technique. Additionally, survey techniques based on questionnaires were employed. The objective of the empirical phase was to assess students in pedagogical specialties' understanding of modern pedagogical technology and their readiness to employ them in their future professional endeavors. The findings of the study indicate that the majority of prospective teachers have a positive perception of contemporary educational technologies. Most respondents consider modern pedagogical tools and project-based approaches as effective means for improving their teaching abilities and enhancing their professional competence. The study concludes that contemporary pedagogical technologies play an important role in improving the pedagogical skills of future teachers. Their effective integration into higher education contributes to the development of professional readiness, instructional competence, and positive attitudes toward innovative teaching practices.*

Keywords: *future teachers, Pedagogical skills, Professional abilities, professional competencies, pedagogical technologies, modern educational technologies, professional practice, educational difficulties.*

1. Introduction

One of the most important strategic elements in the development of pedagogical skills is acknowledged to be contemporary pedagogical technologies. They help students develop high-level professional competencies, modernize the educational process, and increase its efficacy. By altering forms, content, and instructional strategies, these technologies seek to raise the standard of education while developing students' capacity for independent thought, problem-solving, and practical application.

The effective implementation of modern pedagogical technologies requires teachers to possess not only deep theoretical knowledge but also competencies in integrating innovative approaches into their professional practice. From this perspective, improving the professional training of future teachers, particularly by developing their practical skills in applying modern educational technologies, becomes a priority.

A teacher demonstrates pedagogical mastery when they are able to create an educational process that is based on contemporary technology, implement interactive techniques successfully, make use of digital learning resources, and efficiently plan lessons. This method improves the quality of learning outcomes, increases students' cognitive engagement, and turns them into active learners.

Additionally, the employment of contemporary pedagogical technology enhances students' hands-on training, improves their capacity to adapt to work settings, and helps them become competitive specialists. Therefore, the development of pedagogical skills in future instructors is contingent upon the widespread integration of these technologies into higher education.

2. Literature Review

This study's theoretical framework is based on recent academic publications that discuss how contemporary educational technology help aspiring instructors strengthen their pedagogical abilities. Laurillard (2022), Hwang (2023), Luckin (2023), Redecker (2022), Mishra and Koehler (TPACK framework), and Voogt et al. (2021), in particular, have made important contributions by thoroughly examining how technology-enhanced learning environments support pedagogical competence, instructional design, and teachers' professional development.

In the context of global digital transformation, many countries have prioritized the integration of educational technologies into teacher education systems. Redecker (2022) claims that digital competency frameworks like DigCompEdu specify the fundamental technological and pedagogical abilities that educators need to acquire in order to successfully incorporate digital technologies into their teaching practices. In a similar vein, Hwang (2023) highlights how AI-driven educational systems and smart learning environments greatly improve teachers' capacity for instructional decision-making and tailored learning.

It is commonly acknowledged that contemporary educational technologies are a catalyst for enhancing instructional abilities. According to Luckin (2023), artificial intelligence in education gives educators cutting-edge resources for evidence-based decision-making, adaptive teaching, and learning analytics. In her conversational framework of learning design, Laurillard (2022) emphasizes how digital technologies allow for the methodical enhancement of instructional techniques through iterative instructional design and reflective practice.

Additionally, studies show that technology-enhanced learning environments help future teachers acquire critical 21st-century abilities. ICT integration in teacher education promotes teamwork, communication, creativity, and digital literacy, according to Voogt et al. (2021). These skills are essential for improving pedagogical efficacy and guaranteeing preparedness for contemporary educational difficulties.

Mishra and Koehler (2006) offer an important theoretical viewpoint. Their TPACK framework (Technological Pedagogical Content Knowledge) shows that integrating technological knowledge, pedagogical tactics, and subject matter expertise is necessary for effective teaching with technology. Recent research (2021–2024) has made extensive use of this paradigm to assess teachers' preparedness for instructional innovation and digital pedagogy.

Furthermore, current empirical research emphasizes the value of technology-integrated and project-based learning strategies in teacher preparation. According to Tondeur et al. (2022), classroom practice and instructional design abilities are much enhanced when ICT is meaningfully incorporated into teacher training programs. In a similar vein, learning management systems, artificial intelligence applications, and digital simulation tools give aspiring educators the chance to participate in collaborative learning, reflective practice, and real-time feedback procedures.

3. Research Methodology

This study's theoretical and analytical research design aims to investigate how contemporary educational technologies contribute to the growth of future teachers' pedagogical abilities. Questionnaire-based surveys and empirical data collecting are not used in this study. Rather, it is based on a comparative analysis, synthesis of pertinent theoretical and empirical research, and a rigorous examination of the current body of scientific literature.

The methodological approach is based on a review of recent worldwide scholarly papers in the areas of teacher professional development, educational technologies, and digital pedagogy. Studies addressing the incorporation of contemporary educational technologies—such as interactive teaching strategies, digital learning tools, and technology-enhanced instructional models—into higher education practice receive special attention.

Additionally, many theoretical views on the development of pedagogical competence through the use of contemporary educational technology are examined using a comparative analysis method. The techniques of generalization and synthesis are used to pinpoint important patterns, conceptual models, and successful strategies that support the development of future educators' pedagogical abilities.

The study is predicated on the idea that the methodical incorporation of contemporary educational technology into the teaching and learning process is intimately linked to the development of pedagogical abilities in higher education. It is also believed that exposing future teachers to technology-enhanced pedagogical models fosters their growth in reflective thinking, instructional design proficiency, and general professional preparedness.

As a result, rather than gathering primary factual data, the methodology of this study is mostly qualitative and conceptual in character, concentrating on the analysis and interpretation of current scientific knowledge.

4. Results and Discussion

The examination of recent scientific literature shows that contemporary educational technologies are important for improving future teachers' pedagogical abilities. The examined research consistently show how using digital tools, interactive learning settings, and technology-enhanced instructional models enhances professional competence, reflective practice, and instructional design in teacher education.

The study's main conclusion is that learner-centered pedagogical approaches can replace traditional teacher-centered instruction with the help of contemporary educational technologies. Future educators will be able to create more adaptable and flexible teaching methods thanks to this change, which is crucial for meeting the changing demands of modern educational systems. Specifically, interactive technologies and digital learning platforms facilitate personalized learning and increase students' involvement in the educational process.

The literature also shows that the development of pedagogical ability is greatly aided by technology-enhanced learning environments. Future educators who are exposed to these kinds of settings show enhanced skills in lesson preparation, instructional organization, and the efficient use of teaching resources. Additionally, reflective thinking is encouraged by contemporary technology, which enables educators to assess their own methods critically and enhance their professional performance over time.

The increasing importance of digital competence as a fundamental element of educational mastery is another significant conclusion. According to studies, educators with excellent digital abilities are better equipped to incorporate cutting-edge teaching strategies and adjust to new

difficulties in education. In order to attain successful teaching results, frameworks like TPACK (Technological Pedagogical Content Knowledge) emphasize the significance of integrating pedagogical, technological, and subject-specific knowledge.

Additionally, 21st-century abilities like critical thinking, creativity, teamwork, and problem-solving are developed through the use of contemporary instructional technology. These skills are becoming more widely acknowledged as being crucial for educators and learners in contemporary learning environments. Therefore, including technology into teacher education increases both general professional preparation and pedagogical skills.

Notwithstanding these favorable results, the literature also notes a number of difficulties with the use of instructional technologies. These include the requirement for ongoing professional development programs, restricted access to technology resources, and some teacher educators' lack of digital competency. For modern technologies to be successfully included into teacher education programs, these issues must be resolved.

Overall, the results of this study support the idea that contemporary educational technology play a significant role in helping aspiring teachers strengthen their pedagogical abilities. Their successful integration into higher education enhances professional competence, improves teaching quality, and guarantees preparedness for the demands of contemporary learning contexts.

5. Conclusion

This study shows that contemporary educational technology play a critical role in improving future teachers' pedagogical abilities. Digital and technologically enhanced learning environments greatly increase instructional design, pedagogical decision-making, and reflective practice, according to theoretical study.

The incorporation of these tools increases essential professional competences, especially digital literacy and 21st-century skills, and encourages learner-centered methods. The premise that effective teaching necessitates the integration of pedagogical, technological, and subject knowledge is further supported by the TPACK framework.

All things considered, contemporary educational technology are essential to raising the standard of teacher preparation and guaranteeing that future educators are prepared for today's educational issues.

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THE ROLE AND OPPORTUNITIES OF MEDIA EDUCATION IN THE MODERN EDUCATIONAL PROCESS

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Abstract. *This article examines the role and opportunities of media education in the modern educational process. In the digital era, media has become an inseparable part of social, cultural, and educational life. The expansion of the Internet, television, journalism, digital technologies, and online learning has created the need for students to develop media and information literacy. The purpose of this study is to analyze the theoretical foundations of media education and explain its importance in developing students' critical thinking, cultural awareness, moral development, and lifelong learning skills. The study is based on a conceptual review of scholarly views and international approaches to media education, including the works of Razlogov, Fedorov, Mamatova, Sulaymanova, Masterman, and UNESCO documents. The findings show that media education is not limited to technical knowledge or Internet use; rather, it includes the ability to understand, analyze, evaluate, and critically interpret media messages. The article concludes that media education plays an important role in modern pedagogy by strengthening critical autonomy, democratic participation, and independent learning.*

Keywords: *media education; media literacy; information literacy; digital education; critical thinking; educational process; lifelong learning.*

Introduction. It is difficult to imagine the modern world without media. In recent decades, the rapid development of the Internet, television, digital technologies, journalism, and online communication has significantly changed the way people receive, understand, and use information. The process of media digitalization has affected not only journalism and communication but also education. As a result, a new and important direction in pedagogy has emerged: media education**.**

Media education introduces new theoretical and practical concepts into both journalism and pedagogy. It helps learners understand how media messages are created, distributed, interpreted, and evaluated. In the modern educational process, students are no longer passive receivers of information. They are expected to analyze media content critically, distinguish reliable information from unreliable sources, and use digital resources responsibly.

Razlogov (2005) explains that the term *media education* can be understood in a narrow sense as a general cultural branch of education. According to him, in international practice, the terms *media culture* and *information culture* are often used as synonyms for media education. This shows that media education is closely connected with the broader cultural and intellectual development of learners. The importance of media education has also been recognized by UNESCO. In 1982, UNESCO adopted the Declaration on Media Education, which emphasized the need to make the principles and opportunities of media education accessible to learners. Later, UNESCO described media education as the study of modern media theory and practice. This definition demonstrates that media education includes both theoretical understanding and practical skills.

In many developed countries, media education is now taught as a compulsory subject. This indicates its growing importance in preparing students for life in an information-rich society. In Uzbekistan, media education and media information literacy are also becoming increasingly relevant, especially because young people actively use the Internet, social networks, television, and other media platforms.

Mamatova and Sulaymanova (2015) note that mass communication channels and information agencies have a strong influence on lifelong learning. Therefore, not only future journalists but all citizens need to understand how media and information services, including libraries, archives, the Internet, and television, function. This means that media education should be viewed as an essential part of general education.

The purpose of this article is to analyze the role and opportunities of media education in the modern educational process. The article discusses the theoretical foundations of media education, its connection with media and information literacy, its importance for students' intellectual and cultural development, and its role in strengthening critical thinking and lifelong learning.

Materials and Methods. This study is based on a conceptual and literature-based research approach. Since the topic focuses on the role and opportunities of media education in the educational process, the article does not use experimental or statistical data. Instead, it analyzes scholarly views, theoretical definitions, and international approaches to media education.

The main materials used in this study include academic works and institutional documents related to media education and media literacy. These sources include Razlogov's discussion of the meaning of media education, UNESCO documents on media education, Fedorov's classification of media education types, Mamatova and Sulaymanova's work on media education in Uzbekistan, and Masterman's principles of media education.

The analysis was conducted through the following steps:

First, definitions of media education were reviewed in order to clarify the meaning of the concept. Second, the role of UNESCO and international organizations in promoting media education was examined. Third, the views of researchers on the types, functions, and principles of media education were analyzed. Fourth, the relationship between media education, media literacy, information literacy, and digital literacy was discussed. Finally, the importance of media education in the modern educational process was interpreted from a pedagogical perspective.

This approach makes it possible to identify the main theoretical ideas related to media education and explain how they can be applied in contemporary education.

Results. The analysis shows that media education has become an important component of modern education because of the growing influence of media on human life. Media is no longer limited to newspapers, radio, or television. Today, it includes the Internet, social networks, digital platforms, online learning systems, electronic games, advertising, cinema, and many other forms of communication. Therefore, students need special skills to understand and critically evaluate media content. One of the key findings is that media education is closely connected with general cultural education**.** Razlogov (2005) emphasizes that media education can be understood as part of general education because it supports the cultural development of learners. This means that media education does not only teach technical skills; it also develops students' worldview, cultural awareness, moral thinking, and ability to participate in society. Another important finding is that UNESCO has played a major role in promoting media education at the international level. UNESCO's definition of media education as the study of modern media theory and practice highlights the dual nature of this field. On the one hand, students need to understand how media

systems function. On the other hand, they need practical skills to use, analyze, and evaluate media messages. The study also shows that media education is not only necessary for future journalists. According to Mamatova and Sulaymanova (2015), every citizen should understand how information services work and how media messages influence society. Libraries, archives, television, newspapers, the Internet, and other information systems are part of people's lifelong learning. Therefore, media education should be integrated into different levels of education.

Fedorov (2004) identifies several types of media education. First, media education prepares future professionals for work in the press, radio, television, cinema, video, and Internet environments. These professionals may include journalists, editors, directors, actors, producers, and cameramen. Second, media education trains educators who teach media culture courses in schools, colleges, universities, and other educational institutions. Third, media education is part of general education for students and independent learners. It can be delivered through print media, television, video, DVD, the Internet, distance learning, clubs, and self-study.

The findings also show that media education is interdisciplinary. It is related not only to pedagogy but also to cinema, theatre, literary studies, cultural studies, history, psychology, and communication studies. This interdisciplinary nature makes media education a flexible and useful field for developing students' analytical and creative abilities.

Another result concerns the role of media education during the COVID-19 pandemic. The pandemic increased the importance of online and hybrid learning systems. As education moved to digital platforms, students and teachers had to use media technologies more actively. This situation showed that media education is not only a theoretical subject but also a practical necessity in modern education. The article also identifies the importance of media education in youth development. For example, the newspaper *Karakalpakstan Yoshlary* has a special column titled "Internet and Youth," which focuses on the education of young people in the Internet era. However, media education should not be limited only to Internet use. It also includes television education, journalism, cinema, advertising, digital games, and other forms of media.

Masterman's 18 principles of media education provide an important theoretical foundation for understanding the field. According to Masterman, media education is a serious and important matter because it strengthens democratic structures and expands the power of the majority. He argues that the central concept of media education is representation. Media does not simply reflect reality; it represents and reconstructs reality through symbolic and sign systems. Masterman also emphasizes that media education is a lifelong process. Its goal is not only to develop critical thinking but also to develop critical autonomy. This means that students should be able to apply critical thinking skills in new situations and take responsibility for their own learning. Media education should be research-based, active, participatory, dialogic, collaborative, and connected with real-life situations.

The analysis further shows that media education is closely related to several forms of literacy. These include:

- media literacy;
- information literacy;
- literacy in free expression;
- library literacy;
- news literacy;
- computer literacy;
- Internet literacy;

- digital technology literacy;
- film literacy;
- electronic game literacy;
- television literacy;
- advertising literacy.

Mamatova and Sulaymanova also explain that media literacy in journalism includes media literacy, free expression literacy, library literacy, news literacy, Internet literacy, digital technology literacy, and television literacy, including cinema and advertising. This demonstrates that media education is a broad concept that includes many practical and intellectual skills.

At the global level, many organizations use the term media education**.** UNESCO also uses the concept of Media and Information Literacy because modern communication platforms are converging. In this context, media literacy and information literacy are not separate fields but interconnected skills needed for effective participation in modern society.

Discussion. The results show that media education has become one of the key requirements of the modern educational process. In the past, education was mainly based on textbooks, teachers, and classroom instruction. Today, students receive information from many sources, including the Internet, social networks, television, online videos, digital games, advertising, and news platforms. Therefore, the task of education is not only to provide knowledge but also to teach students how to evaluate information critically.

One of the most important functions of media education is the development of **critical thinking**. Students should not accept media messages automatically. They need to ask who created the message, what purpose it serves, what values it promotes, what information it includes, and what information it excludes. In this sense, media education helps students become active and responsible participants in society.

Media education also supports **critical autonomy**. Masterman's principles show that the goal of media education is not only to teach students about media but also to help them think independently. Critical autonomy means that learners can analyze new media situations without always depending on the teacher. This is especially important in the digital era, where students encounter a large amount of information every day.

Another important aspect of media education is its democratic function. Media education teaches students to understand representation, power, ideology, and communication. Since media can influence public opinion, cultural values, and social behavior, students need to understand how media messages shape reality. This strengthens democratic participation and social responsibility.

The interdisciplinary nature of media education also makes it valuable for pedagogy. Since it is connected with journalism, cinema, theatre, literature, culture, history, psychology, and communication, it can enrich different subjects in the curriculum. For example, media education can be used in language classes to analyze news texts, in history lessons to evaluate documentary films, and in literature classes to compare written and visual narratives.

The COVID-19 pandemic demonstrated the practical importance of media education. During online and hybrid learning, students and teachers had to use digital platforms, online resources, video materials, and communication technologies. This experience showed that digital competence alone is not enough. Students also need media literacy and information literacy to use online resources effectively and responsibly.

In Uzbekistan, the development of media education is especially important because young people actively use the Internet and digital media. Educational institutions need to help students

understand not only the technical side of media use but also its ethical, cultural, and social dimensions. Media education can protect students from misinformation, manipulation, harmful content, and passive consumption of information. At the same time, media education should not be reduced to Internet literacy only. As the reviewed literature shows, it also includes television, cinema, advertising, journalism, libraries, archives, digital games, and other forms of media. Therefore, a comprehensive approach is necessary. The discussion also shows that media education should be integrated into lifelong learning. It is important not only for schoolchildren and university students but also for adults. Since media technologies are constantly changing, people need to update their media literacy skills throughout life.

Conclusion. Media education plays an important role in the modern educational process. It helps students understand, analyze, evaluate, and use media content critically and responsibly. In the digital era, students are surrounded by different forms of media, including the Internet, television, journalism, social networks, online learning platforms, advertising, cinema, and digital technologies. Therefore, media education has become an essential part of general education.

The study shows that media education contributes to students' intellectual, cultural, moral, and social development. It strengthens critical thinking, critical autonomy, democratic participation, and lifelong learning. It also prepares students to become active and responsible users of information. The analysis of UNESCO documents and the works of Razlogov, Fedorov, Mamatova, Sulaymanova, and Masterman shows that media education is a broad and interdisciplinary field. It includes media literacy, information literacy, Internet literacy, digital technology literacy, news literacy, television literacy, advertising literacy, and other related forms of literacy.

In conclusion, media education should be developed as an important component of modern pedagogy. It should be integrated into different levels of education and adapted to the needs of contemporary learners. By doing so, educational institutions can prepare students for active, critical, and responsible participation in the media-rich world.

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A METHODOLOGICAL FRAMEWORK FOR INTEGRATING ASSISTIVE TECHNOLOGIES IN ELT FOR STUDENTS WITH SEVERE MOTOR IMPAIRMENTS

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Abstract. *This study develops a methodological framework for integrating assistive technologies into English language teaching (ELT) for bachelor students with severe motor impairments at Karakalpak State University named after Berdakh. Although inclusive education reforms in Uzbekistan have improved physical access to higher education, pedagogical access remains limited when learning tasks depend on handwriting, typing, and manual classroom participation. The first stage of the project used a mixed-methods needs assessment with 40 students from Journalism and Karakalpak Philology programs. Survey items and qualitative observations, including an informal English Party, explored students' English-learning goals, participation barriers, anxiety, and perceptions of speech-to-text and eye-tracking technologies. The findings show that the main obstacle is not cognitive readiness for English, but the manual-centric design of tasks and assessment. The proposed Voice-First framework combines Vygotskian sociocultural theory, the Zone of Proximal Development, and Universal Design for Learning to reposition assistive technology as a mediating tool for learner autonomy. The paper recommends formal recognition of alternative input, specialized digital laboratories, and teacher retraining in inclusive ELT methodology.*

Keywords: *ELT methodology; inclusive higher education; assistive technology; severe motor impairments; Universal Design for Learning; Uzbekistan; learner autonomy.*

1. Introduction

Inclusive education is often discussed in terms of ramps, elevators, accessible entrances, and other visible forms of physical infrastructure. These changes are important, especially in higher education institutions where students with disabilities have historically been excluded from full participation. However, for students with severe motor impairments and zero or near-zero hand mobility, physical access is only the first layer of inclusion. A student may enter the classroom but still remain pedagogically excluded if all learning activities require handwriting, keyboard input, notebook copying, or quick written answers. In English language teaching, this problem is particularly serious because competence is usually demonstrated through visible output: written sentences, vocabulary exercises, note-taking, translation tasks, and timed tests.

The present study addresses this hidden barrier through the concept of pedagogical access. Pedagogical access means the degree to which a learner can participate in classroom tasks, assessment, feedback, and social interaction without being blocked by irrelevant physical requirements. In the context of Karakalpak State University named after Berdakh, students with severe motor impairments in Journalism and Karakalpak Philology reported strong interest in English for professional communication, postgraduate study, media work, and academic mobility. Yet the traditional manual format of ELT tasks makes their linguistic ability appear lower than their real cognitive and communicative potential.

This article presents the first stage of a longitudinal project. It does not test a finished technological product. Instead, it conducts a needs assessment and formulates a methodological framework for future implementation. The central argument is that students with severe motor impairments do not primarily need a simplified English curriculum. They need alternative means of action and expression that allow them to demonstrate the same linguistic knowledge through voice, gaze, and digitally mediated interaction. The proposed Voice-First paradigm therefore treats assistive technology not as an optional device, but as a methodological condition for fair ELT participation.

The study is aligned with Uzbekistan's policy direction toward inclusive education and digital transformation. Presidential Resolution No. PP-4860, adopted on 13 October 2020, emphasizes support for learners with special educational needs and the expansion of inclusive practice. While that policy agenda is commonly associated with schools, higher education also requires concrete methodological tools. For university students preparing for careers in journalism and philology, English is not a secondary subject; it is a gateway to information, publication, employment, and postgraduate opportunity.

2. Literature Review and Theoretical Framework

The theoretical foundation of the study combines sociocultural theory, the Zone of Proximal Development, Universal Design for Learning, and contemporary work on assistive technology. Vygotsky's sociocultural theory is useful because it rejects a purely medical view of disability. From this perspective, learning difficulties are not located only inside the individual body. They emerge from the relationship between learners, tools, tasks, and social environments. A student who cannot hold a pen may be disabled by a pen-and-paper test, but the same student may be able to produce complex ideas through speech recognition or eye-gaze writing. The impairment remains real, but its educational consequences depend on the available mediating tools.

The Zone of Proximal Development (ZPD) is especially relevant to inclusive ELT. In many classrooms, the teacher or assistant becomes the student's hands: writing answers, turning pages, or selecting options. This human support can be compassionate, but it can also reduce autonomy when it becomes the only available channel of expression. Assistive technology can function as a mediating tool that enables the learner to move from dependence toward independent performance. In this sense, speech-to-text software, eye-tracking systems, adaptive keyboards, and voice-controlled learning platforms are not external additions to teaching. They are part of the instructional method.

Universal Design for Learning (UDL) provides the practical design logic for this framework. UDL argues that curricula should offer multiple means of engagement, representation, action, and expression. In ELT, this means that the objective of a writing task should be linguistic production, not the physical act of holding a pen. The objective of a vocabulary test should be lexical knowledge, not manual speed. The objective of classroom participation should be communicative competence, not the ability to raise a hand quickly or write on a board. When tasks are redesigned according to UDL principles, students with motor impairments can be assessed on language rather than on motor performance.

Assistive technology research also shows that digital tools can support academic independence, self-efficacy, and access to feedback. However, technology alone does not guarantee inclusion. If teachers continue to design manual-centric tasks, a device may remain unused or may become a symbolic object rather than a real learning pathway. Therefore, this paper focuses on methodology before hardware. The Voice-First paradigm proposed here begins with

classroom needs, linguistic goals, and assessment fairness, then selects the technology that can serve those goals.

3. Materials and Methods

The first stage of the project used a mixed-methods needs assessment design. The aim was to identify the linguistic, psychological, and technological needs of bachelor students with severe motor impairments before introducing specialized hardware. A total of 40 students participated. They were enrolled in the first, second, or third year of bachelor programs at Karakalpak State University, mainly in Journalism and Karakalpak Philology. These programs were selected because English has clear professional value for future media workers, language specialists, researchers, and postgraduate students.

Data collection consisted of three components. First, a short Voice-Powered English Impact Survey was administered. The survey included ten questions focusing on perceived usefulness of English, current independence in written tasks, experience of anxiety, reliance on assistants, and attitudes toward speech-to-text and eye-tracking tools. Second, qualitative classroom and social observations were conducted to understand how students participated in English-related activities when manual output was reduced. Third, an informal English Party was organized. This event created a low-pressure setting in which students could express their communicative desires, social confidence, and willingness to use English outside a formal lesson.

The study did not apply technical devices during this first stage. This decision was deliberate. Many technology projects begin by purchasing equipment and then trying to fit pedagogy around it. The present project reverses that sequence. It first identifies barriers, desired learning outcomes, and methodological requirements, then proposes the type of technology that can address those requirements. For this reason, the results are presented as descriptive needs-assessment indicators rather than experimental outcomes. The next stage of the project will involve practical testing of speech-to-text and eye-tracking tools with measures such as words per minute, text accuracy, pronunciation accuracy, task completion, and changes in learner autonomy.

Table 1. Needs-assessment design and data sources

Component	Purpose	Output for the framework
VPE Impact Survey	Identify perceived usefulness, autonomy, anxiety, and technology attitudes	Preliminary descriptive indicators for task redesign
Classroom/social observation	Record participation patterns when manual output is reduced or required	Identification of manual-centric barriers
English Party	Observe informal communicative desire and peer interaction	Evidence for social motivation and oral participation potential

4. Results

The needs assessment showed a strong mismatch between students' English-learning motivation and their current opportunities for independent academic output. Most participants viewed English as important for future employment, postgraduate study, access to international

information, and professional communication. Interest was especially visible among students preparing for careers connected to journalism, translation, philology, public communication, and academic research. In the English Party setting, students showed willingness to participate orally when the atmosphere was informal and when they were not immediately required to write by hand.

At the same time, current independent writing access was low. Students frequently depended on assistants, classmates, relatives, or teachers to record answers. This dependence created a construct-irrelevant barrier: the final academic product did not always represent the student's independent language ability, but rather the availability and accuracy of a human scribe. Such support can help a student complete a task, but it can also create delays, reduce privacy, and weaken the student's sense of ownership over learning.

Figure 1 summarizes the preliminary needs profile. The strongest indicators were the perceived importance of English for future employment, interest in voice-first tools, and desire to participate in oral English activities. The lowest indicator was current independent writing access. This contrast supports the central argument of the study: motivation and cognitive readiness are present, but the instructional channel is not accessible enough.

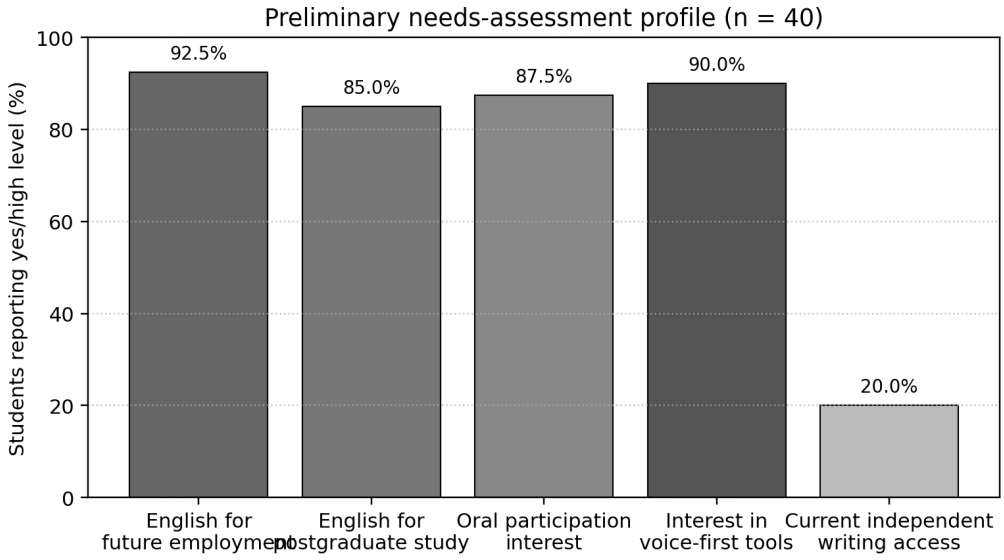


Figure 1. Preliminary needs-assessment profile of students with severe motor impairments (n = 40).

Figure 2 presents the main barriers identified during the needs assessment. The most frequently reported barrier was the manual writing or typing requirement, followed by limited access to assistive technology and reliance on human scribes. A related issue was foreign language anxiety. Students described anxiety not only as fear of making linguistic mistakes, but also as fear of being unable to respond quickly, being misunderstood through an assistant, or being judged by written performance that does not reflect their ideas. Teacher training was another important barrier because many instructors had limited experience adapting ELT tasks through UDL or assistive technology.

Qualitative observation confirmed these survey patterns. When written output was central, students became passive or dependent. When oral interaction, peer support, and flexible response modes were allowed, they became more engaged. The English Party was particularly useful because it showed that communicative desire could emerge strongly in a supportive environment.

Students did not reject English; they rejected the conditions that made English performance physically inaccessible.

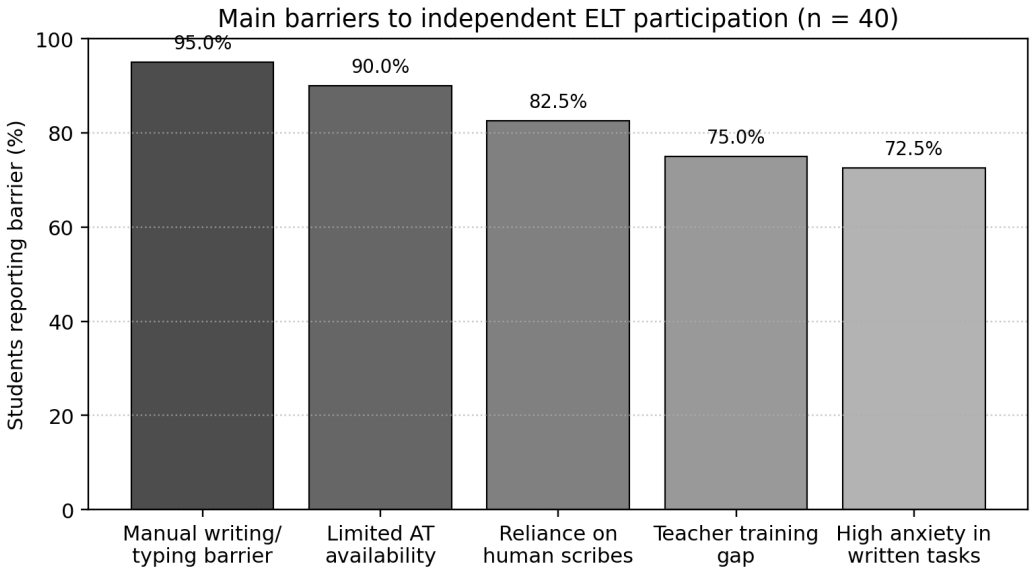


Figure 2. Main barriers to independent participation in ELT tasks (n = 40).

5. Proposed Voice-First Methodological Framework

Based on the needs assessment, the study proposes a Voice-First methodological framework for inclusive ELT. The framework does not mean that speech should replace all forms of writing. Rather, it means that voice should become the first accessible channel through which students with severe motor impairments can plan, produce, revise, and submit English output. For some learners, eye-tracking or gaze-based selection may be combined with voice input, especially when speech is difficult, noisy environments reduce recognition accuracy, or written editing is required.

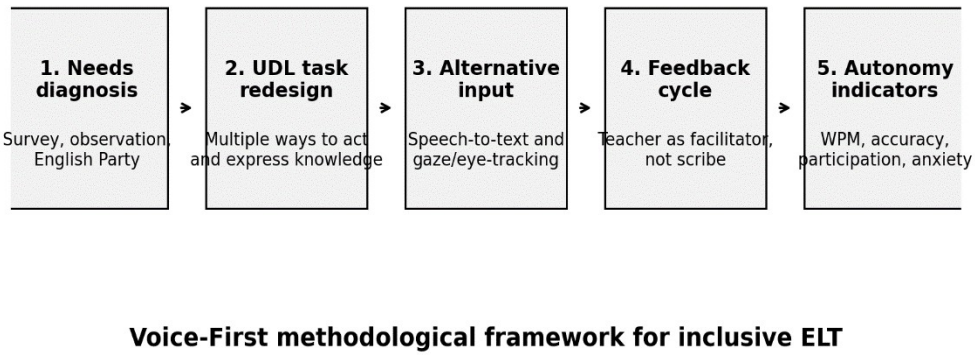


Figure 3. Voice-First methodological framework for integrating assistive technologies in inclusive ELT.

As shown in Figure 3, the framework begins with needs diagnosis. Teachers first identify which classroom tasks are blocked by manual demands and which linguistic objectives can be assessed through alternative input. The second step is UDL-based task redesign. For example, a vocabulary exercise can be answered orally, through speech-to-text, through gaze selection, or

through a supported digital quiz. The third step is alternative input integration, including speech-to-text for drafting and eye-tracking for navigation, editing, or selecting answers. The fourth step is a feedback cycle in which the teacher responds to language quality instead of acting as a scribe. The final step is evaluation through autonomy indicators such as task completion, speed, accuracy, participation frequency, and learner confidence.

This framework changes the teacher's role. In manual-centric pedagogy, the teacher or assistant often becomes the mediator of every written response. In the Voice-First model, the teacher becomes a facilitator of digital autonomy. Feedback focuses on vocabulary choice, pronunciation, sentence structure, coherence, and pragmatic appropriateness. The student's physical impairment is no longer allowed to dominate the assessment of linguistic competence.

6. Discussion

The findings reveal a methodological gap in Central Asian ELT: inclusion is often understood as physical placement in the classroom, while the deeper issue of accessible output remains underdeveloped. For students with severe motor impairments, the absence of alternative input technologies produces a form of pedagogical silence. They may understand a text, formulate an answer, or want to participate in discussion, but the classroom system may not provide a direct channel for expression. Over time, this can lead to learned helplessness, lower self-confidence, and academic records that underestimate real ability.

The Voice-First paradigm addresses this gap by separating language competence from manual performance. In traditional lessons, writing speed, notebook control, and keyboard use may be confused with learning. In inclusive ELT, these must be treated as access variables, not as the target construct. A student who dictates a grammatically accurate paragraph through speech-to-text has demonstrated linguistic competence even if the paragraph was not handwritten. Similarly, a student who selects lexical items through eye gaze may show vocabulary knowledge even without a pen or keyboard.

The study also has implications for assessment. Universities should formally recognize alternative input modes in English and other subjects. Without institutional recognition, teachers may hesitate to accept voice-produced or gaze-produced work as valid. Clear policies are needed so that students are not forced to negotiate access separately in every course. Assessment rubrics should evaluate language objectives, while technical support should ensure that the mode of production does not create unfair advantage or disadvantage.

Another implication concerns teacher training. Assistive technology will not transform ELT if teachers are not trained to design accessible tasks. Professional development should therefore include UDL, digital assessment, speech-to-text correction strategies, and ethical use of human assistance. Teachers also need practical guidance for Uzbek-English and Karakalpak-English contexts. Speech recognition tools may misread local accents, code-switching, or phonetic interference. A localized implementation strategy is necessary so that technology supports, rather than punishes, multilingual learners.

7. Conclusion and Recommendations

The first stage of this study shows that severe motor impairment is not a cognitive barrier to English mastery. The primary barrier is the continued use of manual-centric pedagogy in classrooms, assignments, and assessments. Students in Journalism and Karakalpak Philology at Karakalpak State University demonstrate strong motivation to learn English and clear awareness of its professional value, but their independence is restricted when written output depends on pens, keyboards, or human scribes.

Three recommendations follow from the findings. First, universities should recognize voice-driven and gaze-driven input as legitimate forms of academic response when manual production is not possible. This recognition should apply not only to English but also to other subjects where knowledge is currently measured through written output. Second, higher education institutions should establish inclusive digital laboratories equipped with speech-to-text software, adaptive interfaces, eye-tracking systems, headphones, microphones, and accessible workstations. Third, teachers should be retrained in UDL and assistive technology methodology so that inclusion becomes part of lesson planning rather than an emergency accommodation.

Future research should move from needs assessment to implementation. The next phase should test speech-to-text and eye-tracking tools in real ELT lessons and measure words per minute, recognition accuracy, task completion time, revision quality, participation frequency, and anxiety reduction. A longitudinal design would also make it possible to examine whether digital autonomy improves academic confidence and English proficiency over time. By connecting inclusive policy, ELT methodology, and assistive technology, Karakalpak State University can become a regional model for accessible higher education in Central Asia.

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THE IMPORTANCE OF PSYCHOLOGICAL AND PEDAGOGICAL SUPPORT FOR PARENTS IN AN INCLUSIVE ENVIRONMENT WITHIN THE PRESCHOOL EDUCATION SYSTEM

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Abstract. *This article analyzes the theoretical, regulatory-legal, and practical foundations of psychological and pedagogical support for parents in the process of forming an inclusive environment in the preschool education system. It substantiates that the inclusion of children with special educational needs in the educational and upbringing process is not only an organizational and pedagogical issue, but also a complex socio-pedagogical process requiring systematic cooperation among the family, educational institution, teacher, psychologist, defectologist, speech therapist, and the wider community. The article also substantiates the necessity of organizing psychological support for parents on the basis of diagnostic, counseling, cooperation, correctional-pedagogical, educational-awareness, and monitoring stages.*

Keywords*: inclusive education, preschool education, special educational needs, parents, psychological support, pedagogical cooperation, inclusive environment, correctional-pedagogical process.*

INTRODUCTION

At present, in the development of the preschool education system, comprehensive support of the child's personality, consideration of his or her individual capabilities, developmental pace, level of social adaptation, and educational needs are emerging as important methodological approaches. In particular, involving children with special educational needs in the preschool education process and creating a psychologically safe, pedagogically flexible, and socially supportive environment for them are among the priority directions of modern educational policy.

Inclusive education is essentially a humanistic pedagogical system aimed at ensuring every child's right to education, realizing his or her personal potential, helping the child find a place within society, and ensuring active participation in social life. In this process, the child is regarded as the central subject, while the educational environment is adapted to the child's needs. In this regard, inclusive education is not merely a set of special pedagogical services, but a broad educational approach based on equality, tolerance, social justice, and recognition of human dignity.

In the Presidential Decree of the Republic of Uzbekistan No. PF–152 dated September 30, 2024, tasks were identified to ensure continuity and coherence between preschool and general secondary education, improve the quality and effectiveness of preschool education, and widely introduce innovative, advanced pedagogical, and digital technologies into the educational process. Furthermore, this Decree supported the initiative to establish inclusive education groups on an

experimental basis in one state preschool educational organization of a general type in each district and city beginning from January 1, 2025.

This situation demonstrates the necessity of developing the principle of inclusiveness in the preschool education system through practical mechanisms. However, the effectiveness of organizing inclusive groups cannot be limited only to establishing the pedagogical process, attracting specialists, or creating material and technical conditions. In this process, psychological and pedagogical support for parents, their proper understanding of the essence of inclusive education, their confidence in their child's abilities, and their readiness to cooperate with the educational institution are important factors.

MATERIALS AND METHODS

This study is based on a theoretical, regulatory-legal, and practice-oriented analysis of psychological and pedagogical support for parents in an inclusive preschool education environment. The methodological basis of the article consists of the analysis of national legal documents, pedagogical principles of inclusive education, and practical directions for cooperation among preschool educational organizations, families, and specialists.

The regulatory basis includes the Presidential Decree of the Republic of Uzbekistan No. PF–152 dated September 30, 2024, the Order No. 392 of the Minister of Preschool and School Education dated December 10, 2024, the Law of the Republic of Uzbekistan "On Preschool Education and Upbringing," the State Standard for Preschool Education and Upbringing, and the "Ilk Qadam" State Curriculum. These documents were examined to identify the organizational, legal, and pedagogical requirements for inclusive education groups and parental support.

The practical-methodological approach of the article is built on five main directions: diagnostic study of the child and family; counseling and psychological assistance for parents; organization of pedagogical cooperation among parents, teachers, psychologists, defectologists, and speech therapists; formation of inclusive culture among parents and the community; and monitoring of the child's developmental dynamics and parental involvement.

Within this approach, diagnostics is considered not as a means of control or evaluation, but as a scientific-practical process that helps determine the content of psychological and pedagogical assistance provided to the family. Counseling methods include empathetic communication, individual consultation, group training, exchange of positive experiences, and emotional support. Pedagogical cooperation involves regular information exchange with parents, recommendation of developmental exercises for home use, and joint analysis of the child's achievements. Monitoring is used to evaluate changes in the child's development, parental activity, and the effectiveness of pedagogical recommendations.

RESULTS

The analysis shows that the family environment plays a decisive role in the development of a child with special educational needs. The child's initial emotional experiences, self-acceptance, trust in others, communication activity, and social adaptation are primarily shaped through parental attitudes. If parents correctly accept the developmental characteristics of their child, believe in the child's abilities, and cooperate with the educational institution, the child's adaptation to the educational environment becomes relatively effective. Conversely, parental anxiety, depression, denial, or distrust toward specialists may negatively affect the effectiveness of correctional-pedagogical work carried out with the child.

The study identifies psychological and pedagogical support for parents as an integral, systemic, and strategic component of inclusive preschool education. The main result of such

support is not only informing parents, but also transforming them into active partners in their child's development, providing emotional support, strengthening psychological stability, and improving pedagogical competence.

The findings indicate that inclusive education groups require permanent and purposeful work with parents. The Order No. 392 of the Minister of Preschool and School Education defines the main tasks of state preschool educational organizations where inclusive groups are established as providing psychological and pedagogical support to children with special educational needs and their parents, studying and implementing advanced local and foreign experiences in inclusive education, assisting children in mastering educational programs, and widely promoting inclusive education among teachers, parents, and the population.

The results also show that a stage-by-stage model is appropriate for organizing parental support. First, the needs of the child and family should be diagnosed. Second, parents should receive scientific-practical explanations about the content of inclusive education, the child's developmental characteristics, and the possibilities of the educational institution. Third, individual and group consultations involving psychologists, defectologists, speech therapists, and teachers should be organized. Fourth, parents should be involved as partners in the child's educational and developmental activities. Finally, the child's developmental dynamics and the results of cooperation with parents should be monitored.

This model makes it possible to organize psychological support for parents as a continuous, result-oriented pedagogical-psychological process. It also strengthens parents' confidence in their child's abilities, ensures the practical implementation of pedagogical recommendations, and reinforces continuity between the educational institution and the family.

DISCUSSION

The effectiveness of working with parents in inclusive education practice is determined by several factors. First, an open, sincere, and trusting relationship toward parents should be established within the educational institution. Second, the information provided to parents should be scientifically grounded, understandable, and practically significant. Third, parents should be involved in the pedagogical process not only when problems arise, but at every stage of the child's development.

In this process, the cooperation model among "parent — child — teacher — specialist — community" is of particular importance. This model connects the child's activities within the educational institution with the family environment, ensures consistency in correctional-pedagogical work, and strengthens the psychological stability of parents.

Furthermore, psychological and pedagogical support for parents in an inclusive environment has not an indirect but a direct influence on the child's socialization. When parents develop positive attitudes, confidence, and readiness for cooperation, the child's adaptation to the educational environment becomes easier, communication activity increases, and opportunities for self-expression expand.

The formation of an inclusive culture is also essential. The effectiveness of inclusive education depends not only on specialists, but also on the socio-psychological environment within the community. Therefore, it is important to explain the essence and content of inclusive education among parents, teachers, neighborhood communities, and the public, to foster positive attitudes toward children with special educational needs, and to eliminate stereotypes and misconceptions.

At the same time, the organization of parental support requires educators and specialists to possess a high level of professional competence, communication culture, empathy, diagnostic

analysis skills, and an individualized approach. Without these professional qualities, inclusive education may remain formal rather than becoming a meaningful supportive environment for children and their families.

CONCLUSION

In conclusion, the formation of an inclusive environment in the preschool education system is an important pedagogical condition for ensuring the involvement of children with special educational needs in education, their social adaptation, and individual development. However, the true effectiveness of inclusive education is determined not merely by the child's admission to the educational institution, but by whether the child feels safe, valued, and a full member of the community within this environment.

In this process, psychological and pedagogical support for parents occupies a central place. Parents are the child's first educators, primary emotional support, and an important social link connecting the child with the educational institution. Therefore, work with parents in preschool educational organizations should be systematically organized on the basis of diagnostics, counseling, pedagogical cooperation, formation of inclusive culture, advocacy and explanatory activities, and monitoring.

The tasks defined in Presidential Decree No. PF–152 and in Order No. 392 of the Minister of Preschool and School Education establish the legal, organizational, and practical foundations for the development of inclusive education. Effective implementation of these tasks requires strengthening cooperation among preschool educational organizations, families, neighborhood communities, specialists, and the public.

Thus, psychological and pedagogical support for parents in an inclusive environment is evaluated as an important scientific-practical mechanism ensuring the development, socialization, and successful integration of children with special educational needs into the educational process within the preschool education system.

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SOCIO-PEDAGOGICAL MECHANISMS FOR FORMING AN INCLUSIVE ENVIRONMENT IN PRESCHOOL EDUCATION

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Abstract. *This article analyzes the socio-pedagogical content, theoretical foundations, and practical mechanisms for forming an inclusive environment in preschool educational organizations. It substantiates that inclusive education is not limited only to involving children with special educational needs in the general educational environment, but represents a complex pedagogical process aimed at supporting each child's individual abilities, developmental pace, psychological state, and social adaptation. The article reveals the importance of cooperation among the head of the organization, teacher, psychologist, defectologist, speech therapist, parents, and the community in effectively organizing an inclusive environment. In addition, a staged mechanism for managing an inclusive environment in preschool education is proposed, based on diagnosis, adaptation, support, cooperation, monitoring, and correction.*

Keywords*: inclusive education, preschool education, inclusive environment, special educational needs, social adaptation, pedagogical cooperation, correctional-pedagogical support, child development.*

INTRODUCTION

In the modern education system, human dignity, equal opportunities, social justice, and a person-centered approach are recognized as priority principles. Especially at the preschool education stage, the timely identification of each child's developmental potential, the creation of an educational and upbringing environment appropriate to their individual needs, and the provision of social adaptation to society are considered important pedagogical tasks. From this point of view, inclusive education is an important direction that strengthens the humanistic content of the preschool education system and creates opportunities for every child to receive education, develop, and find their place in the community.

The concept of inclusive education is not limited only to admitting children with special educational needs to an educational organization. It includes adapting the educational environment to the needs of the child, ensuring an individual approach in the pedagogical process, creating a positive psychological climate in the group, strengthening cooperation between parents and specialists, and creating favorable conditions for the child's socialization. In this process, the main attention is focused not on the child's limitations, but on their opportunities, abilities, developmental dynamics, and personal needs.

The Decree of the President of the Republic of Uzbekistan No. PF-152 dated September 30, 2024, identifies the improvement of the quality and effectiveness of preschool education, the broad introduction of innovations, advanced pedagogical and digital technologies into the educational process, and the development of children's cognitive, psychomotor, social, communicative, and creative competencies as important tasks. In addition, this document supports the initiative to open

inclusive education groups, on an experimental basis, in one general-type state preschool educational organization in each district and city starting from January 1, 2025.

These legal foundations define the formation of an inclusive environment in preschool educational organizations as an important task at the level of state policy. However, the implementation of inclusive education in practice is directly connected not only with regulatory documents, but also with the internal environment of the educational organization, the readiness of the pedagogical team, cooperation among specialists, the active participation of parents, and a positive social attitude toward the child.

MATERIALS AND METHODS

This article uses a theoretical, regulatory-legal, and socio-pedagogical analytical approach to examine mechanisms for forming an inclusive environment in preschool education. The material of the study consists of national legal documents, pedagogical principles of inclusive education, and practical organizational mechanisms used in preschool educational organizations.

The regulatory basis of the analysis includes the Decree of the President of the Republic of Uzbekistan No. PF-152 dated September 30, 2024, the Order of the Minister of Preschool and School Education No. 392 dated December 10, 2024, the Law of the Republic of Uzbekistan “On Preschool Education and Upbringing,” the State Standard of Preschool Education and Upbringing, and the “Ilk Qadam” State Curriculum. These sources were used to identify the legal, organizational, and methodological foundations for developing inclusive education groups in preschool educational organizations.

The methodological framework is based on the analysis of five interconnected dimensions of inclusive environment formation: child-centered pedagogy, psychological safety, professional competence of teachers, cooperation among specialists and parents, and monitoring of child development. The article also systematizes a staged socio-pedagogical mechanism consisting of diagnosis, adaptation of the educational environment, psychological and pedagogical support, organization of cooperation, monitoring, and correction.

Within this framework, diagnosis refers to the study of the child’s developmental state, educational needs, social adaptation level, and family environment. Adaptation refers to the adjustment of the group room, activity content, games, visual aids, verbal instructions, and pedagogical approaches to the child’s needs. Support includes practical assistance provided by the psychologist, defectologist, speech therapist, educator, and head of the organization. Monitoring and correction refer to the regular analysis of developmental dynamics and the improvement of the individual work plan when necessary.

RESULTS

The analysis shows that the formation of an inclusive environment in preschool education is based, first of all, on a pedagogical approach that places the child’s personality at the center. In this approach, each child is viewed as a subject with their own developmental path, individual needs, and distinctive features of perception, communication, and activity. When working with children with special educational needs, the pedagogical process should not be aimed at adapting the child to existing educational requirements, but rather at adapting the educational environment to the child’s abilities.

One of the key results of the analysis is that psychological safety is a fundamental condition of an inclusive environment. Only when a child feels accepted, valued, understood, and supported in the educational organization do their activity, communication, and participation in play and learning activities increase. Therefore, the formation of warm, trusting, tolerant, and supportive

relationships between teachers and children in a preschool educational organization is a key condition of inclusive education.

The analysis also identifies the professional competence of the teacher as an important factor in forming an inclusive environment. The teacher must understand the developmental characteristics of the child, identify their strengths, organize activities in a differentiated way, and adapt games and types of activities to the child's capabilities. At the same time, the teacher should be able to gradually involve a child with special educational needs in communication with peers and in the system of social relationships without isolating them from the group.

The results further show that inclusive education requires a comprehensive organizational approach. Inclusive education is not only the individual work of a teacher with a child, but also requires reorganizing the activities of the entire educational organization, strengthening cooperation with the family, clearly defining the distribution of responsibilities among specialists, and developing an inclusive culture in public consciousness.

The management activity of the head of the preschool educational organization plays an important role in the effective organization of an inclusive environment. The head of the organization should coordinate material and technical conditions, staff capacity, methodological support, cooperation among specialists, work with parents, and the monitoring system. It is advisable for the head of the organization to consider inclusive education not as a separate activity, but as part of the overall development strategy of the organization.

The analysis identifies the need for a clear cooperation mechanism among the deputy director, psychologist, defectologist, speech therapist, educator, and parents. For example, the psychologist studies the child's emotional state, social adaptation, and level of communication; the defectologist and speech therapist carry out correctional work based on individual developmental characteristics; the educator ensures active participation in the daily educational and upbringing process; and the parent continues recommendations within the family environment. Such cooperation ensures continuity and consistency in the child's development.

Another result is that an effective communication system with parents is necessary. The parent of a child with special educational needs should not be a passive observer in the educational process, but an active partner. If the parent correctly understands the developmental characteristics of the child and establishes a trusting relationship with teachers and specialists, the child's adaptation to the educational environment becomes easier.

The analysis also shows that working with the children's group is important in inclusive education. The ability of a child with special educational needs to feel comfortable in the group largely depends on the attitude of peers. Through games, collective activities, small-group work, role-play situations, and creative activities, the initial skills of inclusive culture are formed in children.

Finally, the staged socio-pedagogical mechanism for forming an inclusive environment may be expressed through five main stages: diagnosis, adaptation of the educational environment, psychological and pedagogical support, organization of cooperation, and monitoring with correction. This mechanism helps organize inclusive education not as a random or formal process, but as a scientifically grounded, purposeful, consistent, and result-oriented pedagogical system.

DISCUSSION

The effective implementation of inclusive education in preschool educational organizations depends on several pedagogical, psychological, and organizational factors. First, inclusive values must be formed within the pedagogical team. If teachers perceive inclusive education as an

additional burden or as a task that belongs only to special specialists, it becomes difficult to achieve the expected results. Therefore, the development of inclusive competence, tolerance, an individual approach, and a culture of cooperation among teachers is of urgent importance.

Second, in inclusive education, the child's development should not be assessed only through academic or lesson-related results. For preschool children, such indicators as communication, independent movement, self-expression, playing with peers, following simple rules, emotional stability, and social adaptation are also important developmental outcomes.

Third, continuity between the family and the educational organization must be ensured. If a child is supported in the educational organization but neglected in the family, or, conversely, supported in the family but does not find appropriate conditions in the educational organization, interruptions occur in the developmental process. Therefore, cooperation with parents should be considered a central link in inclusive education.

Fourth, the formation of an inclusive environment is also connected with public consciousness. A positive attitude toward children with special educational needs, their acceptance, support, and recognition as equal members of society require broad educational and awareness-raising work. In this sense, a preschool educational organization functions not only as an educational institution, but also as an important social institution that develops inclusive culture in society.

The adaptation of educational and methodological materials is also important in organizing an inclusive environment. For children with special educational needs, the content of activities, the volume of tasks, visual materials, verbal instructions, movement games, and assessment methods should be selected in accordance with the child's capabilities. In this process, it is effective not to completely separate the child from the general program, but to adapt the program to the child's needs. This ensures one of the main principles of inclusive education: a flexible educational environment.

The digital tasks defined in Decree No. PF-152, including the placement of electronic resources, audiovisual products, educational-methodological materials, and child developmental map data in information systems, expand opportunities for digital monitoring, feedback with parents, and systematic observation of child development in inclusive education.

CONCLUSION

In conclusion, the formation of an inclusive environment in preschool education is an important socio-pedagogical mechanism for ensuring the effective involvement of children with special educational needs in the educational and upbringing process, their social adaptation, and personal development. An inclusive environment is an educational space based on care, acceptance, trust, support, and an individual approach to the child.

The analysis shows that the effectiveness of inclusive education depends on adapting the educational environment to the needs of the child, ensuring professional cooperation among teachers and specialists, actively involving parents in the process, forming an atmosphere of tolerance and mutual support in the children's group, regularly monitoring developmental dynamics, and supporting the educational process with scientific-methodological and digital tools.

The tasks defined in the Decree of the President of the Republic of Uzbekistan No. PF-152 and the Order of the Minister of Preschool and School Education No. 392 determine the regulatory-legal, organizational, and practical foundations for developing inclusive education in the preschool education system. In order to effectively implement these tasks, it is necessary to establish a

systematic, staged, and cooperation-based work mechanism aimed at forming an inclusive environment in every preschool educational organization.

Thus, the formation of an inclusive environment in preschool education serves to create a humane, tolerant, socially active, and developmental educational environment not only for children with special educational needs, but for all children. This is directly connected with the main goal of modern preschool education: to reveal the potential of every child, prepare them for social life, and develop an education system based on human dignity.

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PEDAGOGICAL SCIENTIFIC FOUNDATIONS OF THE FORMATION OF ENTREPRENEURIAL SKILLS IN STUDENTS OF VOCATIONAL EDUCATIONAL INSTITUTIONS

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Abstract. *This article examines the pedagogical scientific foundations for developing entrepreneurial skills among students of vocational educational institutions. It highlights the role of entrepreneurship education in strengthening students' initiative, creativity, financial literacy, responsibility, and readiness for practical business activity. The study emphasizes that entrepreneurial competence is not formed only through the teaching of economic concepts, but also through motivation, innovative learning technologies, project-based learning, business simulations, and cooperation with industry. The article analyzes national reforms in Uzbekistan's vocational education system, compares them with international experience, and identifies existing challenges such as weak employer participation, insufficient practical training, and low student motivation. Based on theoretical analysis, pedagogical experiment, observation, and questionnaire methods, the article proposes improving strategic management, modernizing curricula, strengthening dual education, and integrating innovative entrepreneurial tasks into vocational education. The findings show that motivation-based pedagogical approaches are essential for forming sustainable entrepreneurial skills.*

Keywords: *entrepreneurial skills, vocational education, motivation, innovation, business competence, dual education, strategic management.*

Introduction. The scientifically based conditions created in our state, the achievements being made, "The dream of a new Uzbekistan, in relation to our days, is a miracle of the present era, an ideological and spiritual foundation that determines its true form, the conditions and factors created for the creative work being carried out and the students, a clear and vivid expression of the creativity and creative enthusiasm inherent in our people, and large-scale current reforms.

"Entrepreneurship economics is a broad field of study of business and the production, distribution and trade, as well as the targeted consumption of goods and services. To be precise, it is an important step and process related to the processing and production, use and constant control of resources, based on the problem. Entrepreneurship is defined as a social sphere that emphasizes discourse and material expressions. Today, the new educational direction is to raise the level of informational training of teachers of vocational educational institutions to the level of management of their development in the formation of a person. In this process, the creation of new manuals and educational literature plays a special role, which is a leading tool in raising the education system to a qualitatively new level. Based on the Law of the Republic of Uzbekistan "On Education" and the Decree of the President of the Republic of Uzbekistan "On additional measures to further improve the professional education system" No. PF-5812 dated September 6, 2019, professional education in the form of 3-year compulsory education is established a new primary, secondary and secondary specialized vocational education system, aligned with the levels of the International Standard

Classification of Education, and educational institutions with differentiated educational programs have been established. This system has been highly appreciated by international organizations for being organized in accordance with international standards. Several projects are currently being implemented with many foreign partners to build trust in and develop the system.

Literature review. The formation of entrepreneurial skills in students and the study of the role of innovative elements and motivation in this is one of the important areas at the intersection of pedagogy and psychology.

In my analysis of the literature on this issue, I can distinguish three main directions. In the study of the innovative elements and motivational foundations of entrepreneurial activity, David McClelland's theory of the pursuit of success is considered the foundation. According to him, in individuals with high entrepreneurial potential, achieving success is the main and most important factor. Awakening or forming this need in the educational process forms in them the skills to assess risk and feel responsibility from the heart. Also important is Albert Rinatour's Self-Enhancement Theory. Only if vocational education students can convince themselves that they can implement their entrepreneurial idea (i.e., if they have internal motivation), then entrepreneurial skills will be formed and developed equally. In European education standards, entrepreneurship is interpreted more clearly and not only as a business, but also as a model of entrepreneurial competences. According to this model, innovative elements and motivation and determination are recognized as one of the sixteen core competencies of entrepreneurship. Modern researchers such as K.Robinson and R.Panet have studied the role of creativity and intrinsic motivation in education in a broad sense and emphasize the need to create an educational environment that does not stifle the entrepreneurial spirit.

As R. Panet emphasizes in his work, autonomy and skill, rather than external incentives (grades, awards), are the main innovative elements and motives of entrepreneurship. Uzbek scientists have also analyzed this issue from the perspective of the national educational environment. In particular, Inoyatov and J. Gulyomov have extensively covered the issues of developing students' economic thinking in the modernization of the education system. N. Muslimov's research scientifically and practically substantiates the role of innovative elements and motivation in the formation of professional competence of future specialists. M. Saidov paid serious attention to the integration of family environment and professional education in the upbringing of entrepreneurial qualities in students.

Research methodology. This study was organized on the basis of a mixed approach, including quantitative and qualitative methods of analysis of innovative elements, in order to determine the impact of educational motivation on the formation of entrepreneurial skills in students. The research process was conducted among Vocational Education students in the 2023-2024 academic year. A total of 110 Vocational Education students were recruited as a sample group and divided into two groups: Control group (55 people): A group where classes are taught using the traditional theoretical teaching method. Experimental group (55 people): A group where innovative elements and motivational technologies based on the EntreComp model and entrepreneurship are used. The following instrumental methods were used during the study: Questionnaire: To determine the entrepreneurial inclination and level of internal motivation of vocational education students, V. Gershikov's M-T (Types of Motivation) questionnaire and self-assessment tests on entrepreneurial competencies were conducted. Pedagogical experiment: To increase the motivation of students divided into experimental groups, Project-based learning and - Business innovation simulation methods are introduced. Observation: Students' activity in the

lesson process, quick decision-making reaction speed in unexpected situations, and ability to work in a team were assessed on a 10-point scale. To ensure the scientific and practical accuracy of the study, I analyzed the following variables.

Independent variable: Pedagogical methods aimed at increasing motivation for innovative elements of learning (interactive games, case studies, EntreComp drivers). Dependent variable: Entrepreneurial skills developed in students (initiative, financial literacy, risk management).

Results. The outcomes of entrepreneurship education are formed in 4 main areas: Knowing: Understanding the scientific foundations of entrepreneurship, creating innovative business ideas, market analysis and economic terminology. Implementing: Developing skills in students to create a business plan, develop an international marketing strategy, make accurate financial calculations and manage projects. Being: Forming and developing independence, creativity, critical thinking, a sense of responsibility and new initiatives. Living together: The pedagogical foundations of the formation of entrepreneurial skills in students based on the learning outcomes are the basis for the formation of skills in teamwork, cooperation, negotiation and social responsibility. The process of forming entrepreneurial skills is not limited to teaching economic concepts. The basis of this process is the student's internal desire, learning motivation. Without motivation, there is no acquired knowledge, that is, it is dead knowledge. It has not been put into practice. Today, in vocational education, the inability of students to find a clear practical answer to the question of why they should study is the cause of their low entrepreneurial initiatives. Therefore, studying the role of learning motivation as a catalyst for developing entrepreneurial skills is an extremely important process from a scientific and practical point of view.

Comparison with international experience. Comparing Uzbekistan's current reforms in vocational education with international experience, it is possible to identify its main aspects and areas of lagging behind. As noted above, countries such as Germany, Singapore, and Finland have been using the advantages of dual education for years, and this has become an important factor in supplying qualified personnel capable of introducing innovative elements into their economies. Uzbekistan is also using this experience: I can describe the legal basis of dual education and the strengthening of cooperation with enterprises as a clear example of this. For example, in Singapore, vocational education, professional educational institutions, work in close connection with industry, and in Uzbekistan, the fact that network production enterprises are being attached to technical schools is also consistent with this model. But there are also differences: Until now, in developed countries, the involvement of students in vocational education has been much higher (for example, in Germany, Finland, or Japan, approximately more than half of adolescents go to secondary specialized vocational education).

In Uzbekistan, this figure fell to around 26.5% in 2019–2023, as a result of making college education voluntary. As a result, there was a shortage of personnel in the labor market: according to studies, more than half of industrial enterprises had difficulty finding the qualified workers they needed, due to the distance of the content of education in the old system from practical skills and the disconnection of enterprises from the educational process. The current reforms are valuable in that they are aimed at eliminating these problems. In this regard, it is appropriate to work on adapting the national qualifications framework of vocational education in Uzbekistan to international requirements, based on the experience of international organizations (for example, the European Training Foundation - ETF) and developed countries. With the support of organizations such as the World Bank and the Asian Development Bank, vocational education projects are being implemented, the material and technical base of vocational educational

institutions is being updated, and teacher training programs have begun. In general, the professional vocational education system of Uzbekistan is taking decisive steps towards harmonization with world standards, but in this process, gaps continue to be filled through analysis and comparison. Problems in practice and solutions.

Despite the reforms being implemented, there are still a number of problems in the vocational education system. First, the issue of fragmentation and coordination in the management of the system has not been fully resolved - some line ministries still influence the activities of technical schools in their areas, which creates certain difficulties in implementing a unified state policy. To solve this problem, a more clear distribution of management powers is proposed, for example, the establishment of vocational education management councils in the regions and the inclusion of industry representatives in them.

Secondly, the participation of employers in the development and implementation of curricula has not been fully ensured. In some technical schools, cooperation with enterprises has been well established at the initiative of leaders and teachers, while in others it is not. As a solution to this, it is proposed to strengthen in legislation measures such as mandatory regulation of cooperation with corporations for all vocational education institutions and requiring each graduate to complete a certain number of hours of practical work. Thirdly, the areas of personnel training and their relevance to the labor market require constant monitoring. The electronic platforms and the national qualification system currently being developed serve this purpose, but the issues of training specialists and replenishing the database for their effective use are urgent.

Fourth, there is the issue of student and teacher motivation in vocational education. It has been observed that studying in colleges and technical schools is not the first choice for students in vocational education, often they come to these educational institutions because they cannot transfer to higher education.

Conclusion. The following conclusions and recommendations were formulated on improving the strategic management of the vocational education system in the current changing economic conditions: Improving strategic management mechanisms. It is necessary to organize strategic planning and management in professional educational institutions using modern methods. To do this, each institution should develop a long-term development strategy and regularly update it based on labor market analysis. I recommend using mechanisms such as the introduction of innovations and performance-oriented financing for management. It is also important to improve the skills of managers and management personnel through innovative elements, and train them in strategic management. As a result of improving strategic management, the main criterion is that the system can quickly adapt to changes, use resources rationally, and have clear goals for the quality of education.

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PEDAGOGICAL PROBLEMS OF IMPLEMENTING THE OPEN AND DISTANCE LEARNING (ODL) SYSTEM

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Abstract. *This article aims to study pedagogical issues related to open and distance learning (ODL) systems in the field of pedagogy. It focuses on theoretical approaches, technological approaches and evaluation studies. The analysis shows that open and distance learning is mainly technology-based. Researchers use the technological features of ICT to design and develop ODL environments without much attention and application of theoretical models, pedagogical principles and learning objectives. They seem to follow the usual, general instructional design guidelines for independent learning programs based on hypermedia systems. The main theoretical approach in this regard is constructivism with collaborative learning without resorting to or applying social constructivism. At the same time, our proposal for creating an effective open and distance learning environment in the field of pedagogy is the use of ICT tools in a constructive environment that includes clear didactic goals and learning outcomes.*

Keywords: *open and distance learning (PDF), technological features, information and communication technologies, design, category, technology, theoretical approach, communication, didactics, learning.*

I. Introduction.

Today, our society, our entire way of life, is so developed and intensified that it can even be viewed as an invisible phenomenon. The role of information and communication technologies, which are rapidly entering our lives, is becoming more and more important not only in manufacturing or other spheres, but also in the education system.

As the President of our country Sh. Mirziyoyev noted, “Today, the movement in the modern information space is so intense that it is so far from now that it happened so far away that it cannot be ignored that it has nothing to do with us. It is certainly possible that hundreds of years of development of such a nation or nation can be left behind” [Mirziyoyev SH, 2017].

At the same time, today, Decrees No. PF-6079 dated October 5, 2020 “On approval of the Digital Uzbekistan 2030 Strategy and measures for its implementation”, No. PF-5812 dated September 6, 2019 “On additional measures to further improve the professional education system”, No. PQ-4623 dated February 27, 2020 “On measures for further development of the pedagogical education sector”, No. 648 dated December 7, 2023 “On measures to introduce a credit-module system in professional education”, No. 466 dated August 7, 2020 “On regulating the system of

continuous primary, secondary and secondary specialized professional education in the Republic of Uzbekistan To a certain extent, it serves in the implementation of the tasks set forth in the resolutions of the Ministry of Finance of the Republic of Uzbekistan "On Approval of Regulatory and Legal Documents" and other regulatory and legal documents related to this area.

Open and Distance Education or Open and Distance Learning (ODL) is a quite old approach to education. Distance learning has a history of over a century involving different teaching approaches and following the technological evolution concerning the delivery of educational material and the communication between learners and instructors. Moore and Kearsley have defined distance education as ‘planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as organizational and administrative arrangements [Moore, Michael G.; Greg Kearsley (2011). 20.]

This definition incorporates all the components of distance education, modifying it from face-to-face education with the addition of certain techniques for each component. The term distance although a necessity, puts limitations that concern not only technological aspects, but also pedagogic such as course and instruction design. Distance education has been extended by the term open, that is a desired characteristic.

Open education means open to everyone, but the importance of the term hides in pedagogy and didactics, implying open learning environments. Something that is not evident from the above definition is the generalized idea beyond education, that is pedagogy. Research in open and distance education seldom deals with pedagogic issues such as pedagogic interaction, acquisition of social and life attitudes and values, awareness of and sensitivity to various topics of the real life. This is probably because open and distance education aims at target groups with special characteristics and imminent learning needs (adults and life-long learning, remote students). That is the reason research on open and distance education mainly deals with course and instruction design, dissemination and evaluation of educational material. Research questions that arise on the field of ODL concern both the pedagogic and technological domains and can be compiled as following.

- Are there any pedagogic models special developed for ODL?
- Are the existent theoretical models appropriate for ODL?
- Which ones of the existent pedagogic models are the proper for the design of ODL systems?
- Are the existent cognitive, emotional and psychokinetic taxonomies appropriate for the design of ODL systems?
- Is there the need for pedagogues to develop new theories and models for ODL? • Do the existent guidelines for the design of educational software fit to ODL systems?
- Are the tools Information and Communication Technologies offer adequate for the design of effective ODL environments?

OPEN AND DISTANCE LEARNING: A CRITICAL REVIEW

Distance education may be categorized in four generations (table 1)

GENERATION	TIME	FEATURES	TECHNOLOGIES
First	End of 19 th – beginning of 20th	Corresponden celearning	Printedmaterial, customizedtextbooks

	century		
Second	Early 1970s	Teleconference (radio&television)	Correspondence, radio, television, audio-tapes, telephone
Third	Early 1980s	One-way video two-way audio communication, real time interaction, two way videoconference	Communication networks (satellites), audio, video, CD-ROMs, bulletin boards
Fourth	1996	Interaction and collaboration, shift from instructor-led to learner - centered approach, student – student interaction	Telecommunications, Internet

Table 1. The four generations of ODL, their features and technologies

One can see that all ODL generations are technology driven, with their features to emerge directly from the type of the technology used. Only in the last two generations some pedagogic characteristics appear, such as real time interaction, collaboration and learner-centered education. Again, these issues originate from technological solutions. There are no pedagogic principles that technology serves; rather technology drives the pedagogic principles that are exploited in ODL systems. This is also shown by the relevant research bibliography that follows.

The research on the field of open and distance education may be categorized in three types. Articles on theoretical approaches and on the design of distance learning environments, articles proposing various technological approaches, and papers on the evaluation of ODL systems. This work tries to study the research directions on ODL during the last seven years, covering the fourth generation of open and distance education and arguing on the domination of technological over pedagogic characteristics or vice versa.

The main resources for the bibliographic research were the four world conferences on the www and the Internet and the four, world conferences on educational multimedia and hypermedia & educational telecommunications. Two thousand nine hundred ninety-four research papers 4 have been reviewed from these conferences. The search for more recent articles was on relevant scientific journals. The major areas this search covered are shown in table 2.

Major areas on research on open and distance learning
Advances in Multimedia Application Development Tools
Browsing and Navigation Tools Collaborative Learning and Work
WebToolsandFacilities
VirtualReality
Electronic Publishing, digital libraries and the Web Future Issues in Web Technology
Educational Multimedia on the Web Electronic Commerce
Industries and Services Integration of Web Applications and Services
Statistical Tools and User Tracking Teaching

Computer-Human Interface and Ergonomic Issues
Psychology of Web-Use Search Engines
Courseware Development Data
CognitiveIssues
Societal Issues, including Legal, Standards, and International Issues

Table 2. Major areas on research on open and distance learning

A quick search on journals and textbooks from the domains of social and human sciences has shown that the published work on open and distance education is limited. It seems that pedagogues, although their community ought to offer in the field, do not study ODL from their point of view. Race for example in his Open Learning Handbook giving the ten reasons for open and distance education, has reported on technical and practical rather pedagogic issues. His emphasis was on educational material and the main reason he saw for ODL is the needs of the students. In an overall approach to open and distance education, Keegan was emphasized on two-way communication, interaction and feedback. The author concluded that the theoretical context of distance education could be configured in the context of the general theory of education, and the more important issue was the educational processes and activities (Keegan, 1996). The critical review presented in this article reviews works that have even a little correlation with pedagogic issues. Works having a pure technological approach concerning only architectures and systems for ODL, or assessment of environments concerning technical aspects such as number of hits or clicks are not considered in this article.

II. Literature Review.

The first group of the published work concerns theoretical approaches, as it is referred in titles and abstracts. Bos, Jarmo S. Kestra and Jamie Morgan [Boss, E. S., Kistna, A., Morgan, C. M. 1996. p.p.208-213] proposed the web as a tool for social-constructivist approach. They tried to transfer the well-known Jonassen's seven concepts: active, constructive, collaborative, intentional, conversational, contextualized, and reflective through various activity types and web tools. The most important of these was considered to be knowledge construction through the development of a hypermedia textbook by the students themselves. The authors' approach was the general one followed for the design of stand-alone hypermedia educational software, putting the learners to be the designers of their educational material cooperating through the Internet, and using resources from the web. Bogley and his associates presenting new pedagogies and tools for web-based courses, proposed the same design guidelines as those proposed for standalone hypermedia educational applications, emphasizing on interactivity as well as on the different learning styles of the students [Begley W. A., 1996. p.p.50-57].

Concerning the design of web-based courses, Tsybenko gave emphasis on adaptive interaction and feedback [8] The conference panel concluded that the pedagogical issues at the web are the constructivist student-centered learning environments that are characterized by engaged cooperating and collaborating students with teachers assuming the role of facilitators [Boyle, T. 1997]. It seems that social constructivism is the dominant theoretical model for the design of ODL environments, the same as with stand-alone computer based educational environments. In Giovanni Coray (EPFL) и M. C. Pettenati [Khalid O. et al., 1998. p.p.224-229] have proposed the same teaching techniques as in a traditional classroom for distance education, emphasizing on interaction and student activities. In [Basil A. et al., 1999. p.p.178-183] stated that although

teaching will improve as a result of improved use of the technology, factors other than technology are crucial in determining the way teachers conduct their teaching. The author proposed that a pedagogically oriented understanding of teaching with telecommunications is needed to improve approaches to teaching. He finally proposed student-centered, open and flexible environments. Blanquette and Kanuka proposed constructivist principles within the context of distance education, with their approaches being the same as for the design of stand-alone hypermedia educational software. The authors stated that communication technologies have removed the barrier to participant interaction and shifted the problem to the implementation of constructivist theories in educational software in general. Martinez and her associates [Basil A. et al., 1999. p.p.178-183] were emphasized on the different learning styles for a successful learning in distance education environments.

III. Methodology

They proposed a series of learning issues for intentional, performing and conforming learners, giving the same guidelines as in stand-alone applications. Dud man provided guidelines for creating constructivist-based rich environments for active learning on the web. Her proposal was based on general educational software guidelines. For Dunlap, the main potentials for active learning on the web were collaboration, access to resources, and research, acknowledging the social nature of knowledge construction. Basil and his associates presented a web-based learning environment using Java Script, applying constructivist learning theory replicating the power of stand-alone multimedia applications in the web. The 6 authors emphasized on embedded learning in a social experience, and on the promotion of motivation through interactivity with feedback. Crawford has proposed general guidelines for the design, development and evaluation for distance education environments, which followed the same guidelines with those for stand-alone applications.

Some and Lech, and Gunawardena made the same proposals. Gunawardena argued on interactivity in web-based distance education, proposing three types of interaction. The first was learner-content interaction, where the students work with a web-based instructional program with the system adapting to their inputs. This is something that stands for stand-alone adaptive hypermedia applications too. The potential of the web is on the large number of adaptive resources, which is a technical attribute. The second type of interaction was the learner-instructor interaction that may be more versatile in web-based environments via synchronous and asynchronous communication. The last type was the learner-learner interaction, providing the opportunity for the social negotiation of knowledge and construction of meaning. Again, this could be a potential for distance education, where the learner might interact and exchange experiences with remote users with different considerations.

The author concluded that the above types of interaction in web-based environments support collaborative construction of knowledge through social negotiation, that is a key feature of constructivist learning environments. Again, the theoretical approach during the years to is social constructivism duplicating the same features of stand-alone educational software. [Multiwall and Tallow 2000, p.p.41-45] proposed a Web-based model utilizing a combination of synchronous and asynchronous communication tools. The authors' goal was to maintain the positive aspects of a traditional classroom in an effort to avoid the social isolation problems learners encounter in virtual and remote environments.

The key features of their web-based pedagogy and the implemented instructional approaches were substantially transferred from general educational practices, served by the

technology. The authors concluded that interaction technologies could meet the learning needs of the students in distance learning environments. Proposed learning and design principles for ODL, based on the constructivist paradigm within the framework of a behaviorist step-by-step development process. They emphasized on hypermedia systems, and particularly on interaction that may be more active in distance learning environments. By interaction, the authors meant interaction in instruction, where in ODL environments the real learning 'space' among students becomes closer. They reported that interaction might take place more actively in ODL environments than in traditional classrooms, arguing that interaction is limited in traditional instruction when conducted in large classrooms.

They concluded that synchronous and asynchronous communication serve 'pedagogic' interaction in hypermedia-based distance learning systems. Carries has argued on constructivism in online learning, proposing such a model. The author used asynchronous communications, stating that this type of communication allows students to think about how they want to respond to written messages from others. Gnarled, Berglund and Erikson have proposed the design of web-based simulations for learning, giving two examples for teamwork and one for individual use. The pedagogical strategies they reported in the design process are overload, transfer, affect and cost, the same that stand for all the simulation-based learning environments. Their application was hypermedia based, integrating electronic tools with conventional distance learning tools. The authors reported a great contribution to the learning process.

Their approach seems to follow the classic design guidelines for hypermedia educational software, having a more or less behaviorist character involving questions and answers. Lin and Hsieh in their short review on web-based teaching and learner control seem to follow Leander's and Jarvenpaa's suggestion that 'no particular model is the best approach'. The authors referred to the program and learner control stating that 'web-based instruction systems offer non-sequential control along a continuum', something all ready known and exploited in stand-alone hypermedia educational software. The future research challenges they proposed, are the need for research on interaction between learning styles and course content, on the roles of instructors and learners in virtual classroom, as well as on the role of learning communities.

These three directions are the common research axes for pedagogical research concerning pedagogical and classroom interaction, not directly emerging from ODL systems. Towards the same direction were Riva's ideas stating that 'to create successful learning environments the designers and developers have to understand how communication and interaction, two key features of the learning process, are changed by computers. Riva extended his ideas that hold for every computer assisted learning environment to ODL systems adding that 'they have to explore the possibilities of successfully instructing via networks while proving the learning and cost effectiveness of these innovative systems'. It seems that Lin and Hsieh and Riva proposed the same constructivist framework for both stand-alone and ODL systems. In a recent article Govindasamy noted that 'one of the most crucial prerequisites for successful implementation of e-Learning is the need for careful consideration of the underlying pedagogy'.

The author claimed that the most of the pedagogical principles that apply to the traditional classroom also apply to e-Learning. The published work of the last seven years shows a tendency towards constructivism for the design of open and distance learning environments, with an emphasis on social constructivism involving collaboration between students. The main characteristics for the design of such environments seem to be interaction and feedback, with hypermedia to be the educational environments over the web. Nevertheless, a behaviorist character

emerges from some learning environments, as it is with stand-alone applications. All the researchers propose the same pedagogical principles that apply to stand-alone educational software applications disseminating by the network via asynchronous or synchronous way. In general, we may hold Firdyiwek's comment who identified three distinct theoretical approaches, behaviorist/empiricist, cognitive/rationalist, and situated/pragmatistsociohistoric. Firdyiwek stated that 'these three perspectives and the pedagogical assumptions that evolve out of them map well against the components of courseware systems and the pedagogical practices implied in their integration'. ODL systems reflect broadly one or the other of the above three theoretical perspectives, even this is not made explicit by the developers and in practice the tools they use may be in overlapping ways.

IV. Results and Discussion.

Technological approaches to open and distance learning environments. Regarding the technological approaches to ODL, the majority of the published work may be covered under the general title 'new technologies for old problems. This shows that the researchers simply transfer the already known didactic approaches and instructional design to distance learning environments. Ferguson has argued on the presentation of educational material in web-based environments and on the dialog between students and instructors. This implies a transfer of guidelines of stand-alone hypermedia applications to web environments, emphasizing on interaction and feedback. Koutoumanos and his associates proposed a similar approach. They presented a networked hypermedia system, which is distributed without a central server, consisting of sophisticated search mechanisms.

Borkowski and her associates proposed an integrated working environment for supporting teaching and learning via the web, simply transforming hardcopy linear instructional materials into web-flexible educational and administrative tools. Their main concerns were if the web is a panacea for all courses, and if the students have the basic technological background to make use of the web. Hobbs and Taylor proposed educational multimedia design for web-based education, categorizing the ways for exploitation of web-based learning environments [Boss E. S., et al., 1996]. At first, they proposed the web for research and information seeking, offering the learners a practical means of following up the educational resources discussed. Secondly, they proposed the web as a teaching tool, designing tutorials and interactive online lessons. They also used the web as examiner, offering tests and quizzes for both assessment and self assessment. The authors proposed the web as an educational forum, providing a basis for virtual debate and discovery, and finally as a collaborative environment. Although the authors did not mention pedagogical models and principles, it seems that they apply both constructivist and behaviorist approaches. AbouKhaled and his associates have done a similar approach by the presentation of MEDIT, a distance education prototype for teaching and learning [Khalid O. et al., 1998. p.p.224-229].

Their environment was based on a generic hypermedia authoring system, aiming at the stimulation of information exchange, interaction and collaborative work. Agents and multi agent systems have proposed for the support of teaching and learning by many authors. The main characteristics of such systems are reusability, modularity, adaptability, openness and scalability, features with great importance in educational software. Although there are many references on agent systems, their value in the learning process will be shown when they will incorporate expert characteristics and student models. Wong selected Internet technologies to support interactive teaching and learning at a distance. He put emphasis on interaction with the educational materials

and categorized the technologies into asynchronous and synchronous tools presenting their advantages and limitations.

Evaluation of open and distance learning environments Besides the theoretical approaches and the technological implementations, there is much work on the evaluation of open and distance learning, a topic of major importance in the educational process. Pohjolainen and Roukema presented their experiences and results from the evaluation of a three years pilot project on distance learning in multimedia networks [Blanchet G. et al., 1999. p.p.434-439]. Their main goal was the evaluation of a pedagogically appropriate and technically functional open learning environment, with the main questions being on the support of student-centered learning and on the construction of knowledge. Their project proved functional, with constructivist, intentionality and reflectivity being best realized in those environments enabling project work.

V.Comparative Analysis:

Collaboration was found to pose challenges in many of the environments. The problematic point of the distance learning environments was on how to get learners motivated to the learning tasks and to make active use each other's skills and knowledge. The authors' main conclusion was that efficient and pedagogically sound use of distance learning environments required overall control of the learning process, something that holds for any computer-based open learning environment. Johnson and his associates made a comparative analysis of online versus face-to-face instruction. Their results revealed that the students in the face-to-face course held slightly more positive perceptions about the instructor and overall course quality, although there was no difference between the two course formats in learning outcomes. The authors proposed improvement of the student-instructor communication, and the training of educators on the characteristics and limitations of online programs [Blanchet G. et al., 1999. p.p.434-439]. The results are similar to those of Johnson, implying both the creation of interactive learning environments and the design of discussion activities that can trigger meaningful online discourse. An evaluation of 500 educational websites can be summarized as 'one step ahead for the technology, two steps back for the pedagogy', pointing out the necessity for the involvement of pedagogues to support open and distance learning environments.

Concerning primary school teachers' education and training using telecommunications, teachers became convinced of the potential use of the Internet in the classroom [Baxter J. H., et al., 2000,. p.p.3-13, 32-36].

The teachers were frustrated because of the lack of sufficient technical training, but appreciated pedagogical guidance delivered 10 electronically. Regarding their pupils, teachers reported improved motivation in accessing up to date information and improved research skills concerning information retrieval and evaluation. A different type of evaluation was a study that attempted to identify characteristics of constructivism in open and distance learning environments [Chou C., et al., 2001. p.p. 293-303]. The authors reported absence of the component of constructivist teaching and learning not only in ODL, but also in face-to-face environments. It seems that the minimal existence of constructivist principles in both conventional and distance education practices, may stem from a lack of knowledge of these principles by the instructional designers and educators. Again, the necessity for the involvement of pedagogues to support open and distance learning environments is obvious. Valerie reported on an exploratory study into success factors concerning online education.

The study consisted of a course content that was available online including a summary of the topic under study, slides, readings, multiple choice questions, as well as an electronic bulletin

board, electronic mail and access to a virtual library. The main results of this case study were that the level of interaction between the students and the lecturer appeared predominant in online delivery and lecturers and students need to upgrade their technical skills. The author concluded identifying three critical success factors associated with teaching effectiveness in online education, that is technology, the lecturer, and the students' previous use of technology. Technology was again the predominant factor in ODL. One of the problems the author detected was that the students interacted only with technology and not with other students or the instructor. Yang reported on language learning on the web, in an empirical study with 55 students majoring in Applied English at a junior college [Chou C., et al., 2001. p.p. 293-303].

IHEP main conclusions were that there is a limited theoretical or conceptual framework, there is a lack of research concerning individual learning styles, and there is an emphasis on case studies. Maybe the prophetic and partially confirmed statement by Clark and Craig for multimedia learning environments stands for ODL systems too [Basil A. et al., 1999. p.p.178-183]. These researchers have proposed not to continue multimedia research and application based on expected learning benefits, unless there is a clear theoretical reason to expect learning gains due to any characteristic exclusive to a certain mix of media. But does it stand for ODL too? May the technological features be sufficient and truly drive towards certain theoretical models such as constructivism, as proposed by many researchers?

VI. Recommendations

It seems that the tools provided by Information and Communication Technologies form a context for the design of constructivist learning environments with a social nature creating learning communities involving the cooperation and collaboration of students and giving the role of facilitators to the teachers. These tools are distributed databases for up-to-date information seeking, assessment tools, educational forums, collaborative environments, multiple representations in hypermedia contexts, interactivity and feedback. The ODL environments proposed and used are trying to be open and student centered, taking into account different learning styles. The bibliographic research shows that although there are many virtual learning environments, most of them do not possess all the features that are essential for open and distance learning. Most of them do not present the building of a community as a goal, they do not motivate social immersion, they do not offer multi-user situations, and they lack pedagogical features. As concerns the learning outcomes from constructivist distance environments, knowledge has to be constructed within the group by means of the exchanges among participants, and each participant has to change his/her understanding of create new personal knowledge as a result of interaction within the group.

It seems that constructivism is the theoretical approach to open and distance learning environments. This comes from both the constructivist principles and the technological features of Information and Communication Technologies. Pedagogues and psychologists with a good knowledge of technology and its limitations have to involve its characteristics into constructivist learning environments and guide instructional designers to apply their models for truly constructivist open and distance learning environments. Moreover, technocrats have to cooperate, consult and follow the models proposed by the theorists and instructional designers, without exploiting the 'goodies' of technology to any learning situation.

VII. CONCLUCIONS: We have to seriously think of Govindasamy's remark that 'there is a serious mismatch between the abundance of features in learning management systems and the lack or total absence of explanation on the pedagogy underlying the inclusion of these tools. This is

in coherence with Firdyiwek's statement three years ago, that 'the current chaotic proliferation of tools and the resulting confusion about how to use them is related to the lack of overt integration of pedagogy in courseware authoring systems' [Blanchet G. et al., 1999. p.p.434-439]. A starting point for the design and development of pedagogically sound ODL environments could be the seven principles for constructivist design, compiled by Boyle [Boyle. T. 1997].

1. Provide experience of the knowledge construction process
2. Provide experience in and appreciation of multiple perspectives
3. Embed learning in realistic and relevant contexts
4. Encourage ownership and voice in the learning process
5. Embed learning in social experience
6. Encourage the use of multiple modes of representation
7. Encourage self-awareness of the knowledge construction process.

The tools provided by Information and Communication Technologies can bring into effect the above principles. They can contribute to the design of open and distance learning environments under contexts following certain instructional design, involving proper content and integrating specific learning tasks. Multimedia environments can be parts of constructivist ODL systems providing multiple modes of representation and perspectives for unto-date information retrieval and exchange among students supporting different learning styles. Simulations and visualizations in a collaborative context can provide experience of the knowledge construction process. Collaborative virtual environments can embed learning in realistic and relevant contexts. Synchronous and asynchronous collaborative environments can embed learning in social experience, encourage ownership and voice in the learning process and self-awareness of the knowledge construction process. An example of such an environment is EIKON, an integrated open educational environment for the support of high-school technology courses that combines state-of-the-art information technologies such as virtual reality, hypermedia and networking [Baxter J. H., et al., 2000,. p.p.3-13, 32-36].

It is well known that constructivist principles are hard to implement and it is not acceptable to instructional designers the idea of setting goals in a flexible manner and having students negotiate these for themselves, but only this way constructivism will be integrated into open and distance learning environments. Information and Communication Technologies put the educational system in a new era, in front of accomplished facts. What is the way teaching and learning will be adapted in this new era? Is education ready to accept the necessary changes coming from the introduction of ICT? Does this introduction create a new relation with knowledge and its communication? It seems that ICT tools have the potential to effect the changes needed. The goal is achievable only if both the technology and instruction designers address the underlying gaps in pedagogical coherence. The proper pedagogic use of ICT constitutes by itself an innovative pedagogic methodology that transforms the traditional communication structures and favors the application of many other pedagogic principles that were difficult to be applied up to now in the context of the traditional educational system [Ismailova Z.K..-2010)

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METHODOLOGY FOR DEVELOPING STUDENTS' LOGICAL THINKING THROUGH MECHANICAL PROBLEMS

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Abstract. *The article highlights the methodology of developing logical thinking skills of senior class students of secondary schools through the process of solving problems in the mechanics' section of physics. The psychological-pedagogical foundations of logical thinking are analyzed, and the stages of forming analytical and synthetic thinking through mechanics' problems are developed. The study presents a five-stage algorithm for solving problems, heuristic methods, and ways to activate students' cognitive activity by creating problem situations.*

Keywords: *logical thinking, mechanics problems, physics education, analytical thinking, heuristic method, problem-based learning, problem-solving algorithm, cognitive activity.*

Introduction. One of the main goals of the modern education system is to form in students the skills of independent thinking, problem solving and application of acquired knowledge in practice. The Law of the Republic of Uzbekistan "On Education" and the Concept of Education Development until 2030 set the priority task of increasing the intellectual potential of the younger generation and providing education based on a competency-based approach [Page 1].

One of the most important requirements for education in the 21st century is to arm the student not only with ready-made knowledge, but also to equip him with the skills of thinking, analyzing and drawing conclusions. Logical thinking is the central link in this process. The results of international studies such as PISA and TIMSS show that the indicators of our country's students in solving non-standard problems and analyzing data are still insufficient. This makes improving the methodology of teaching natural sciences such as physics an urgent task [Page 2]

Physics, in particular its mechanics section, has wide opportunities for the development of logical thinking. Mechanics problems require the student not only to memorize formulas, but also to analyze the situation, determine cause-and-effect relationships, put forward hypotheses and come to well-founded conclusions. Therefore, mechanics problems are recognized as an effective didactic tool for the formation of logical thinking.

This article discusses the methodology for the gradual development of students logical thinking by solving mechanics problems, its theoretical foundations and practical mechanisms [Page 5]

Main part. Logical thinking is the process of a person's perception of events using concepts, judgments and conclusions, identifying connections between them and generating new knowledge. In psychological and pedagogical literature, logical thinking is recognized as a form of higher cognitive activity of a person.

In the studies of scientists such as L.S. Vygotsky, J. Piaget, P.Ya. Galperin, V.V. Davidov, N.A. Menchinskaya, logical thinking was analyzed as the main indicator of the child's intellectual development. According to J. Piaget's theory of cognitive development, formal-operational thinking begins to form in adolescents aged 11–15, and it is during this period that the ability to work with abstract concepts, hypothetical-deductive thinking, and use logical operations appears. Therefore, teaching physics, including the mechanics section, in grades 7–11 is the most favorable age for the development of logical thinking [Page 3,4,5,6.7].

There are the following basic operations (actions) of logical thinking:

• analysis – breaking down the whole into parts, studying the internal structure of a phenomenon;

• synthesis – combining the separated parts and recreating the whole;

• comparison – identifying similarities and differences between objects and phenomena;

• generalization – identifying common features common to many phenomena;

• abstraction – separating important features from unimportant ones;

• classification – dividing objects into groups according to their features;

• inference – generating new knowledge by inductive (from the specific to the general) and deductive (from the general to the specific) methods

In the process of solving problems in mechanics, all of these operations are manifested in an integral unity. This makes the mechanics section a holistic didactic tool for developing logical thinking.

Mechanics is one of the first and most fundamental branches of physics, which studies the laws of motion and interaction of bodies. The special role of mechanical problems in the development of logical thinking is explained by the following:

1) Mechanics phenomena are close to the student's everyday experience - they observe the movement, fall, and ejection of objects. This creates conditions for connecting theoretical knowledge with practice, that is, for synthetic thinking.

2) Mechanics problems in most cases require several logical stages: perception of the situation, modeling, selection of formulas, calculation, interpretation of the result.

3) In mechanics, a single phenomenon can be analyzed in various ways (kinematic, dynamic, energetic). This encourages the student to search for alternative solutions, perform comparison and selection operations.

4) Mechanics problems can be presented in various forms, such as graphs, tables, and drawings. This recoding of symbolic information forms an important skill of logical thinking.

The works of researchers V.G. Razumovsky, A.V. Usova, A.A. Boboyev, and others emphasize that the effectiveness of physics teaching is directly related to the student's level of independent problem solving [Page 10,11,12].

The process of solving a problem is the result of logical thinking in action. For the purposeful development of various operations of logical thinking, it is advisable to classify mechanical problems according to their didactic function. The author's classification is presented in the table below:

Table-1. Classification of mechanics problems according to logica operations

№	Issue type	Logical skill to be developed
1	Quality issues	Analysis, identification of cause-and-effect relationships
2	Calculation problems	Sintez, deduktiv xulosa chiqarish
3	Graphics issues	Abstraction, reading symbolic information
4	Experimental issues	Inductive inference, hypothesis formulation

№	Issue type	Logical skill to be developed
5	Problems with alternative solutions	Comparison, selection, evaluation
6	Problematic issues	Holistic logical activity, creative thinking
7	Combined issues	Classification, generalization

This classification allows the teacher to consciously choose the type of problem based on which logical operation is aimed at developing in each lesson.

To consistently develop logical thinking, it is necessary to divide the problem-solving process into clear stages and teach the student a specific mental action at each stage. The five-step algorithm proposed below activates a specific logical operation at each stage:

Stage 1. Perception and analysis of the problem.

The student carefully reads the problem, understands the essence of the physical phenomenon. At this stage, the following questions are asked: "What phenomenon is described in the problem? What objects are involved? In what state are they?". Logical operation - analysis.

Stage 2. Distinguishing between given and sought quantities, writing a short note.

The student translates textual information into a symbolic form: “Given: $v_0 = 0$, $a = 2$ m/s², $t = 5$ s. Find: $S = ?$”. At this stage, abstraction and modeling operations develop.

Stage 3. Planning – developing a solution strategy.

The student plans what formulas to use, what laws to work with. If there is no formula directly, he thinks about how to find intermediate quantities. Logical operation – synthesis and deductive reasoning.

Stage 4. Implementation of the plan - calculation and obtaining the result.

The student performs calculations by substituting values into the selected formulas. Pays attention to units of measurement, accuracy of calculations. Logical operation - algorithmic thinking.

Stage 5. Checking and interpreting the result – reflection.

The student checks the physical content of the answer: “Is this number true? Are the units correct? Can the solution be found in another way?”. It is this stage that forms critical and reflective thinking. Unfortunately, most students skip this stage, although it requires the highest level of logical thinking [Page 9]

Based on the above, the following heuristic methods are effective in developing logical thinking:

1) The “Backward” method - thinking from the beginning to the end. For example, what formula is needed to find the required quantity? Are the quantities involved in this formula given?

2) The “Schematic drawing” method - expressing the problem in the form of a graphic image. This makes an abstract situation visible.

3) “Boundary case analysis” - analyzing the problem in limiting cases such as $t = 0$ or $t \to \infty$. This is a powerful tool for checking the correctness of the answer.

4) The “Analogy” method - comparing a new problem with a previously solved similar problem. This activates the operations of comparison and generalization.

5) The “Problematic situation” method - bringing the student to a state of lack of knowledge and encouraging him to seek new knowledge from it. For example: “What will happen to the objects on it if the Earth suddenly stops?”

6) The “variation problem” method is a method of creating a new problem by slightly changing the conditions of a problem. This helps the student to understand cause-and-effect relationships more deeply.

Consistent use of these methods improves not only the student's physical knowledge, but also his general intellectual culture.

Below is an analysis of a qualitative-computational problem and logical reasoning in solving it.

Problem. A loaded wagon is moving along a straight line. A weight is located under a string hanging from one point of the wagon (mathematical pendulum). The pendulum is at rest. Suddenly the wagon begins to brake. In which direction does the pendulum deviate? Justify your answer.

Reasoning:

1) Let's analyze the situation: the speed of the wagon is decreasing, which means that the wagon has an acceleration directed opposite to the direction of movement ($a < 0$).

2) The pendulum is located in the frame of the wagon. The wagon is considered a non-standard (non-inertial) frame of reference, since it is moving with acceleration.

3) In a non-inertial frame of reference, the weight is affected by the inertial force. This force is directed opposite to the acceleration of the wagon, that is, in the direction of movement of the wagon.

4) Therefore, the pendulum deviates in the direction of movement of the wagon (forward).

5) Verification: we also know from everyday experience that when a bus brakes, the passengers inside tend to move forward. This is a typical manifestation of the phenomenon of inertia.

When solving this problem, the student performs logical operations such as analysis, deductive reasoning, building a physical model, and comparison with everyday experience.

The following criteria have been developed to assess the effectiveness of the proposed methodology:

• the level of correct understanding of the problem condition and the ability to independently compose a brief note;

• the ability to independently choose a solution algorithm;

• the ability to justify the answer from a physical point of view;

• the level of ability to solve problems with non-standard and alternative solutions;

• the ability to analyze one's own solution and find errors (reflexive thinking);

• the speed of assimilation of new knowledge and its application to new situations (transfer).

Diagnostic sections conducted according to these criteria allow an objective assessment of the effectiveness of the methodology [Page 12].

In conclusion, it can be said that the results of the conducted research show that mechanics problems are a powerful didactic tool for developing students' logical thinking. The following conclusions were made:

1) The content and mathematical apparatus of the mechanics section create the most favorable opportunities for the formation of formal-operational thinking in teenage students.

2) Classification of mechanics problems according to the didactic task (qualitative, computational, graphical, experimental, alternative, problematic, combined) allows the teacher to purposefully develop certain logical operations.

3) The five-stage algorithm proposed in the article (perception - symbolization - planning - execution - reflection) teaches the student to solve problems based on a consistent and systematic approach.

4) Heuristic methods - reverse path, schematic drawing, analysis of boundary cases, analogy, problem situations and variational problems - jointly develop different aspects of logical thinking.

5) The effectiveness of the methodology should be assessed not only by the amount of knowledge, but also by the skills of independent thinking, reflection, and knowledge transfer.

In future research, the integration of the proposed methodology with digital educational resources (virtual laboratories, interactive tests, artificial intelligence-based support systems) requires separate study.

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METHODOLOGY FOR INTEGRATING THE COURSE "INFORMATION TECHNOLOGIES IN TECHNICAL SYSTEMS" WITH PROFESSIONAL DISCIPLINES BASED ON VIRTUAL LABORATORIES

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Abstract. *This article highlights the methodological foundations of using virtual laboratories in the integration of the course "Information Technologies in Technical Systems" with professional disciplines. Although the subjects taught in technical fields are often directly related to theoretical knowledge, practical calculations, the operating principles of devices, and digital technologies, certain challenges remain in harmonizing them within a unified educational process [7]. Therefore, the article develops a model for organizing interdisciplinary integration based on virtual laboratories, identifies problems and their solutions, outlines the tasks to be performed, and proposes criteria for evaluating effectiveness. The study examines the processes of virtual laboratories, simulations, electronic resources, interactive assignments, digital analysis, and the formation of professional competencies in an interconnected manner [5]. The results indicate that virtual laboratories provide opportunities to develop students' ability to apply theoretical concepts in practical situations, conduct experiments safely and repeatedly, analyze measurement results, and increase their interest in professional disciplines.*
Keywords: *virtual laboratory, technical systems, information technologies, professional disciplines, integration, simulation, digital competence, methodology.*

Introduction. In contemporary technical higher education, information technologies are regarded not merely as a separate academic subject, but as an essential tool for mastering professional disciplines, analyzing technical processes, and carrying out modeling and control activities [8]. In particular, the use of information technologies in such areas as electrical circuits, electronics, automation, microprocessor-based systems, sensors, digital measuring devices, and technical diagnostics is becoming an integral component of the educational process.

The course "Information Technologies in Technical Systems" develops students' skills in analyzing technical objects using digital tools, processing data, designing algorithms, programming, modeling, and interpreting results in a visual form. However, in practice, this course is often limited to general computer literacy or the study of software tools. As a result, the content of the course is not sufficiently connected with professional disciplines.

Virtual laboratories are considered one of the effective means of addressing this problem, as they make it possible to conduct experiments in a digital environment that are difficult, expensive, hazardous, or time - consuming to perform under real laboratory conditions. A meta-analysis conducted in 2024 on the effectiveness of virtual laboratories in engineering education reported that virtual laboratories have a positive impact on students' learning outcomes. In

addition, systematic literature reviews have emphasized that virtual laboratories offer such advantages as cost reduction, safety assurance, flexibility, and increased accessibility.

Therefore, the present study aims to develop a methodology for integrating the course "Information Technologies in Technical Systems" with professional disciplines based on virtual laboratories and to substantiate its educational effectiveness.

Literature Review. In recent years, virtual laboratories have been widely used in technical and engineering education. They enable students to understand processes before working with real devices, modify parameters, observe results, and analyze errors in a safe environment. Potkonjak et al. describe virtual laboratories as one of the new-generation learning environments in science, technology, and engineering education; such environments are associated with the capabilities of computer graphics, augmented reality, virtual worlds, and digital modeling [3].

A systematic literature review conducted by Wahyudi and co - authors, based on 29 articles indexed in the Scopus database between 2018 and 2023, identified flexibility, safety, cost-effectiveness, and the potential to improve the quality of education as the main advantages of virtual laboratories in engineering education. This view is also important for teaching information technologies in technical systems, since this course requires the integration of real technical objects, measurements, calculations, and software - based analysis.

The 2024 meta - analysis by Li et al. found that virtual laboratories have a positive effect on students' performance in engineering education. This result indicates the need to use virtual laboratories not merely as supplementary visual aids, but as an active component of the educational process.

Interactive simulation platforms such as PhET are also widely used to improve the effectiveness of teaching STEM subjects. The PhET platform provides free interactive simulations in physics, chemistry, biology, mathematics, and other STEM-related topics. The research section of the PhET platform notes that studies are conducted on the design and use of simulations, and that their design is aimed at improving learners' understanding [2].

The Virtual Labs platform is also one of the virtual laboratory resources that serves to reinforce theoretical concepts through experiments in the fields of science and technology. The experiments available on the platform make it possible to supplement real laboratory sessions, visually demonstrate processes that are difficult to understand, and guide students toward independent experimental work.

The literature review shows that virtual laboratories perform the following methodological functions:

- Connect theoretical knowledge with practical experience;
- Strengthen students' independent learning activities;
- Reduce the costs and risks associated with real laboratory work;
- Develop skills in measurement, analysis, and drawing conclusions;

Support the practical organization of interdisciplinary integration.

Methodology. The research methodology was based on the principle of the gradual introduction of virtual laboratories into the educational process in order to integrate the course "Information Technologies in Technical Systems" with professional disciplines. The object of the research is the process of teaching the course "Information Technologies in Technical Systems" in technical fields of study.

The subject of the research is the methodology for integrating this course, based on virtual laboratories, with such professional disciplines as electronics, electrical engineering, automation,

microprocessor systems, and technical measurements. In this context, integration is understood not merely as the mechanical combination of several subjects, but as the purposeful organization of the educational process in which theoretical knowledge, practical tasks, digital tools, and professional competencies are interconnected within a single learning environment [4].

The main idea of integration is that, in the integration process, the course of information technologies is considered as a methodological and technological tool that supports the study of professional disciplines. In other words, information technologies are not taught separately from technical content, but are applied as a means of modeling, measuring, calculating, visualizing, and analyzing real technical processes. This approach allows students to understand the relationship between digital technologies and the practical tasks encountered in their future professional activity [6]. For example, a student studies the parameters of an electrical circuit not only through theoretical formulas, but also by assembling a circuit in a virtual laboratory, changing its parameters, entering the obtained results into a table, constructing graphs, and performing software-based analysis. As a result, the student develops not only subject-specific knowledge, but also practical skills in working with simulation environments, processing experimental data, interpreting graphical results, and drawing scientifically grounded conclusions.

The integration model is presented in Figure 1 as an interdisciplinary integration model based on virtual laboratories. This model demonstrates how professional disciplines, information technologies, and virtual laboratory environments are interconnected in the process of forming students' digital, analytical, and professional competencies.

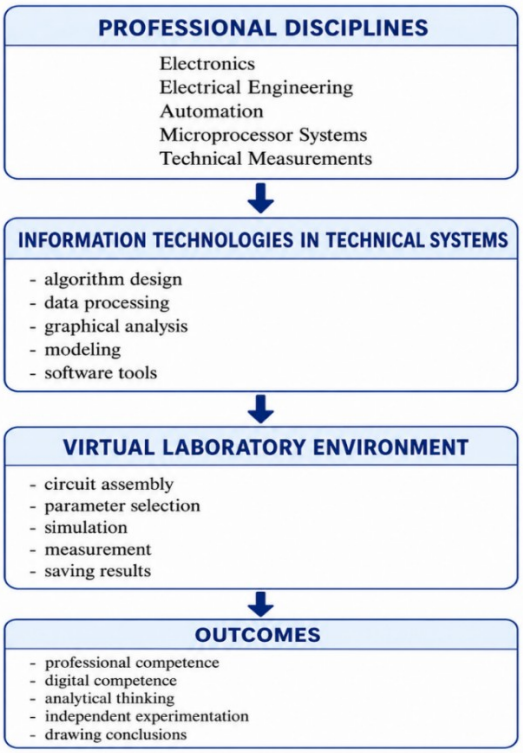


Figure 1. Interdisciplinary Integration Model Based on Virtual Laboratories In this model, the virtual laboratory serves as the central connecting tool. It brings real technical processes from professional disciplines into a digital environment through the use of information technology tools.

In the process of integrating the course "Information Technologies in Technical Systems" with professional disciplines, a number of challenges arise. These can be presented in the following table. Table 1 presents the problems encountered in the integration process and their corresponding solutions.

Table 1. Problems in the Integration Process and Their Proposed Solutions

Problem	Description of the Problem	Proposed Solution
Lack of continuity among disciplines	Information technologies and professional disciplines are taught separately.	Relate each topic to a real technical problem encountered in professional disciplines.
Insufficient real laboratory equipment	Not all students are able to perform experiments at the same time.	Use virtual laboratories and simulators.
Students know the formulas but cannot apply them	Theory is not connected with practical situations.	Introduce the sequence: formula → simulation → table → graph → conclusion.
Programming and technical disciplines remain disconnected	The student does not apply software tools to professional problems.	Process and analyze results using Python, MATLAB, Excel, or web-based simulators.
Assessment is based only on theoretical tests	Practical competence cannot be fully determined.	Assess students on the basis of virtual experiment reports, graphs, conclusions, and oral defense.
Students' independent work is weak	Ready-made information is memorized rather than understood and applied.	Provide tasks based on individual parameters.

To implement the methodology of integration based on virtual laboratories, it is advisable to carry out the following tasks. The topics of the course "Information Technologies in Technical Systems" are compared with professional disciplines [4]. This comparison is presented in Table 2. table 2. Integration of the Topics of "Information Technologies in Technical Systems" with Professional Disciplines

Topic of "Information Technologies in Technical Systems"	Professional Discipline Suitable for Integration	Virtual Laboratory Assignment
Processing data in tables	Electrical Engineering	Calculating the parameters of an RLC circuit
Constructing and analyzing graphs	Electronics	Plotting the volt-ampere characteristic of a diode or transistor
Algorithm design	Automation	Developing a control algorithm based on sensor signals
Fundamentals of programming	Microprocessor Systems	Processing signals from Arduino or ESP32
Modeling	Technical Measurements	Performing digital analysis of measurement errors

Each laboratory assignment is developed according to the following structure: topic title, objective of the work, theoretical background, virtual laboratory source, sequence of implementation, measurement table, graph construction task, analysis of results, control questions, and the requirement to write a conclusion. To prevent students from copying identical results, each student is assigned individual parameters such as R, L, C, U, I, frequency, resistance, or software-based values. This approach strengthens independent work. The results obtained by students in the virtual laboratory are processed using Excel, Python, MATLAB, or other software tools. For example, students prepare tables, construct graphs, determine maximum and minimum values, calculate errors, and compare the obtained results with theoretical data [7].

Results. In the study, a sample pedagogical experiment model was developed to evaluate the effectiveness of the integration methodology based on virtual laboratories in control and experimental groups. The experiment was organized in two groups. The control group was taught through traditional explanation, theoretical assignments, and basic calculations. The experimental group was taught on the basis of virtual laboratories, simulations, graphical analysis, and practical assignments linked to professional disciplines. Students were assessed according to the following criteria. Assessment Criteria

Criterion	**Content**	**Maximum Score**
Theoretical understanding	Knowledge of basic concepts and principles	20
Performing a virtual experiment	Correct execution of the simulation	20
Creating tables and graphs	Analysis of measurement results	20
Linking with a professional discipline	Explanation of the technical process	20
Drawing conclusions	Justification of the obtained results	20
Total		**100**

Table 3. Sample Results: Average Performance of the Control and Experimental Groups

Group	**Initial Test**	**Final Test**	**Increase**
Control group	58 points	71 points	13 points
Experimental group	57 points	84 points	27 points

The results show that the final performance indicators of the experimental group taught on the basis of virtual laboratories were higher than those of the control group. While the increase in the control group amounted to 13 points**,** this indicator reached 27 points in the experimental group. Figure 2 presents the graph illustrating the growth of learning outcomes [5]. It can be seen from the graph that the level of knowledge, practical skills, and analytical thinking in the experimental group increased significantly. The main reason for this is that the virtual laboratory enabled students to study the topic not only by listening or reading, but also by independently conducting experiments, changing parameters, and observing the results. The effectiveness of the integration methodology based on virtual laboratories was manifested in the following aspects:

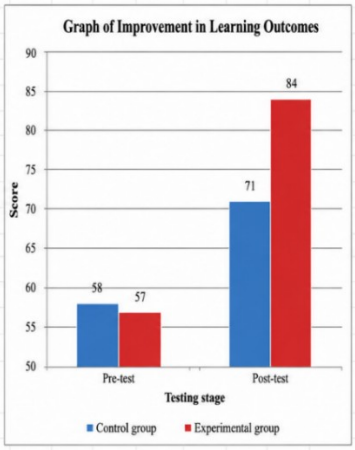
Area of effectiveness	**Achieved result**
Theoretical knowledge	Students began to apply formulas and technical concepts in practical situations.
Practical skills	Skills in assembling circuits, entering parameters, and analyzing results in a virtual environment were developed.

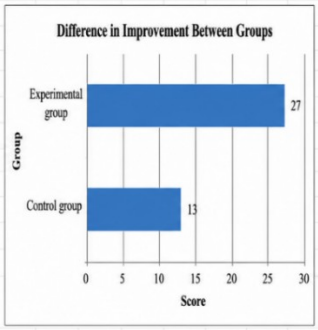
Digital competence	Skills in working with tables, graphs, software-based calculations, and data processing were improved.
Professional competence	The connection with electronics, electrical engineering, and automation disciplines was strengthened.
Independent learning	Students learned to work independently on the basis of individual assignments.
Safety	Opportunities were created to conduct experiments without damaging real equipment.

Indicator	Control group	Experimental group
Pre-test	58	57
Post-test	71	84
Increase (points)	13	27
Increase (%)	22,4%	47,4%

Testing stage	Control group	Experimental group
Pre-test	58	57
Post-test	71	84

Brief conclusion		
Increase in the control group	13	points
Increase in the experimental group	27	points
Difference	14	points
Methodological effectiveness	The experimental group demonstrated higher results	





Discussion. The obtained results indicate that teaching based on virtual laboratories develops not only students' theoretical knowledge, but also their professional and practical competencies. In traditional lessons, students often work with ready - made formulas, ready - made circuits, or ready - made results. In a virtual laboratory, however, the student changes parameters, observes the results, identifies cause – and - effect relationships, and draws conclusions.

For example, when studying an RLC circuit, the student changes the values of resistance, inductance, capacitance, and frequency, and observes current, voltage, reactance, and phase shift. In this process, the course "Information Technologies in Technical Systems" is directly integrated with electrical engineering. The student does not merely memorize the RLC formula, but understands it through virtual experimentation and digital calculation [2].

Similarly, when studying the volt-ampere characteristics of a bipolar transistor, the virtual laboratory ensures integration with electronics. The student measures input and output characteristics, prepares tables, constructs graphs, and analyzes transistor operating modes using information technology tools.

The discussion results show that virtual laboratories have the following pedagogical advantages:

- they make abstract technical concepts more visual;
- they transform the student from a passive listener into an active performer;
- they connect the content of professional disciplines with information technologies;
- they enable the teacher to assign individual tasks;

They help take into account not only test results, but also practical activity in assessment. However, certain limitations also exist. A virtual laboratory cannot completely replace work with real equipment. In a real laboratory, students develop such skills as connecting wires, using measuring instruments, dealing with contact errors, identifying equipment faults, and following

safety rules in practice. Therefore, virtual laboratories should be considered not as a substitute for real laboratories, but as a methodological tool that complements them. The integration methodology based on virtual laboratories is implemented through the following stages [3].

At the stage of theoretical preparation, students are provided with the basic concepts related to the topic. For example, in the case of an RLC circuit, resistance, inductance, capacitance, frequency, impedance, and phase shift are explained.

At the stage of linking with professional disciplines, the relationship between the topic and the relevant professional discipline is identified. For example, an RLC circuit is related to electrical engineering, transistor characteristics to electronics, sensor signals to automation, and microcontrollers to microprocessor systems. At the stage of performing the virtual laboratory work, the student conducts an experiment in the virtual laboratory. The student changes parameters, observes the results, and completes the measurement table [3].

At the stage of processing results using information technologies, the obtained results are processed in Excel, Python, MATLAB, or another software tool. Graphs are constructed, calculations are performed, and the results are analyzed.

Conclusion. The integration of the course “Information Technologies in Technical Systems” with professional disciplines on the basis of virtual laboratories contributes to improving the quality of technical education. This approach enables the simultaneous development of students’ theoretical knowledge, practical skills, digital competence, and professional thinking.

The research results show that virtual laboratories strengthen interdisciplinary connections, increase students’ independent learning activity, connect theoretical knowledge with practical experimentation, develop skills in measurement, graph construction, and analysis, and create opportunities for teaching professional disciplines on the basis of information technologies [1].

Thus, virtual laboratories can be considered an effective methodological tool for teaching the course “Information Technologies in Technical Systems” in a modern, practical, and professionally oriented manner. In the future, it would be advisable to develop this methodology as a set of separate virtual laboratory assignments in the areas of electronics, electrical engineering, automation, microcontroller-based systems, and technical diagnostics.

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DEVELOPMENT OF COGNITIVE-PRAGMATIC COMPETENCE OF FUTURE ELEMENTARY SCHOOL TEACHERS

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Abstract. *This article examines the development of cognitive-pragmatic competence in future elementary school teachers. It analyzes theoretical views of foreign and local scholars on cognition, pragmatics, speech acts, communicative personality, and language use in educational contexts. The study emphasizes the importance of connecting linguistic knowledge with practical communication, critical thinking, motivation, perception, and the ability to understand pragmatic meanings in speech. It proposes a staged model for developing cognitive-pragmatic competence, including comprehension, design, familiarization with evaluation criteria, and linguistic assessment. The article also highlights the role of reading skills, explanatory reading, innovative methods, didactic materials, and multimedia tools in improving students' communicative abilities. The findings suggest that future teachers should be trained to apply cognitive and pragmatic knowledge effectively in oral and written speech, organize interactive learning activities, analyze educational materials critically, and develop tasks that strengthen communicative speech qualities.*

Keywords: *cognitive, pragmatics, modeling, linguistic form, extralinguistics, fragment, correlation, approach, component, functional-semantic analysis, communicative personality.*

Introduction

Aspects of modeling cognitive-pragmatic competence, the situation of the communication process from the perspective of the theory of speech acts, have been criticized by Borkin, Reinhart, Brown and Levinson, Frazer, Goffman, and Formanovskaya. The study of the linguistic form, the diversity of extralinguistic parameters of communication, the difference between fragment and correlation in revealing the full meaning of speech was studied by I.M. Kobozova and Kolshansky.

Communication and communication, the harmonious relationship between the listener and the speaker, and at the same time, speech are activated.

"Cognitiveness and pragmatics should grow in linguistic processes and be based on the presence of a specific need for them, as well as their motivation and purposefulness," says Yu.V. Tufanova.

G.M. Kostyushkina expressed her opinion on the existence of many factors in cognitive-pragmatic approaches.

Improving cognitive and pragmatic competence through a comprehensive systematic analysis, critically studying relevant theories, expressing a logical reaction, vividly reflecting its characteristics in oral and written speech skills, focusing on the individual and freedom of thought in the communication process, determining the conditions of communication, and studying its possibilities. A description of the model for developing cognitive-pragmatic competence and its components requires a structural connection in the relationship between the speaker and the interlocutor's observation.

Materials and methodology

The components of cognitive-pragmatic competence and its functional-semantic analysis, methods of its modeling, and the interpretation of the conceptual foundations of speech remain relevant. This includes definitions, terms, explanations of terms, prospects for the effective implementation of glossaries, the psycho-emotional and motivational state of communication, perception and understanding, the selection and processing of information. We used our model in T.A. van Dijk's "Commute".

According to S.S. Takhtarova, a communicative personality is the result of analyzing the communicative behavior of a person, a certain abstract construct that is modeled.

According to P.Yu. Zolotov, at the communicative stage, students can perform a number of search exercises such as basic, explanatory, parallel, and speech signs of pragmatics for functional identification.

The communication stage includes the following types of tasks: developing pragmatic knowledge through spontaneous communication in couples (using social networks and messengers) with the distribution of roles in writing.

The model, improved by M. Canale, includes four components: grammatical, sociolinguistic, speech, and compensation.

In this regard, based on an analysis of scientific literature and the practical state of theoretical information, we have developed stages for the development of cognitive-pragmatic competencies of future elementary school teachers.

Results and Discussion

The stages of developing the cognitive-pragmatic competencies of future teachers are as follows:

The first stage. The comprehension stage involves enhancing the cognitive abilities of future teachers and providing theoretical information for them to understand the essence of linguistic units and pragmatic phenomena in language.

The second stage. The design stage involves organizing project work and determining the topic's discussion and outcome in collaboration to develop students' cognitive-pragmatic competencies.

The third stage. The stage of familiarization with evaluation criteria involves providing homework assignments to demonstrate, based on a diagram, the extent to which educational resources related to the development of cognitive-pragmatic competencies in textbooks and various methodological support for subjects of the educational process are provided.

The fourth stage. The linguistic stage is the testing and evaluation of students' linguistic knowledge in the process of project creation.

The stages we have developed are the development of grammatical-communicative exercises and tasks to determine the development of students' cognitive-pragmatic competencies, and when evaluating them, the strategies for raising the level of application of theoretical and practical knowledge given in the evaluation criteria in speech are expressed.

Acquiring reading skills is a rather complex process, and its formation takes a long time. Psychologist T.G. Egorov, in his work “Очерки психологии обучении детей читению” divides the process of developing reading skills into three stages: ***analytical, synthetic, and automated***. **The analytical stage** corresponds to the period of literacy training, during which the skill of analyzing words by syllables and reading them in syllables is formed. **The synthetic stage** is characterized by a smooth reading of the word; in this case, visual perception of the word and its

pronunciation largely coincide with understanding the meaning of the word. Reading is carried out by understanding the meaning of the word. Students transition to the synthetic stage in the 3rd grade. In subsequent years, learning will **be automated**, as noted in the textbook "Ona tili o'qitish metodikasi" written under the direction of K. Kasimova.

Professor Askar Zunnunov, reflecting on the content and methods of teaching, emphasizes that the focus on students first acquiring knowledge and then memorizing it is called explanatory reading in the educational process.

Therefore, explanatory reading is reading that leads to thinking, feeling, full understanding of the work, assimilation of the content of the read. explanatory reading ensures understanding of the content of the work, understanding the important idea in the work, the idea put forward by the writer.

Explanatory reading will be successful only if the following principles are fully followed:

1. Organizing education in connection with life.

2. To make reading conscious and effective, rely on the student's life experience and impressions.

3. Organization of visual reading, organization of excursions to nature, historical places, observation of the animal and plant world, familiarization with pictures, tables, objects, and conducting the text in the form of expressive reading by the reader.

In reading lessons in elementary school, poems, fables, fairy tales, stories, legends, proverbs and riddles, and popular science literature are studied. Naturally, each of them is created in its own form, style, and content. Therefore, it is necessary to study works belonging to each genre in a unique way. Of course, the appropriate use of innovative methods, didactic materials, and multimedia tools has a positive impact on the meaningful and interesting nature of the lesson. In conclusion, it can be said that in the development of cognitive-pragmatic competencies in future elementary school teachers, it is justified to bring together and summarize the lexical, grammatical, morphological, and syntactic units of the language as its constituent components.

Conclusion

To improve the development of cognitive-pragmatic competence in future elementary school teachers, it is necessary to understand their cognitive theory, apply it appropriately in their speech and achieve the emergence of thinking about it, understand the pragmatic aspect of language levels, organize educational activities based on modern, innovative methods, listen to subjective opinions and logical, critical conclusions of students based on educational material during the lesson and analysis, developing their ability to generalize and summarize, ensuring cognitive abilities based on the content of pragmatic phenomena and signs in the language, as well as developing assignments for tasks consisting of communicative speech qualities.

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FORECASTING THE APPLIED ASPECTS OF RESULTS-ORIENTED EDUCATION IN IMPROVING THE DIDACTIC TRAINING OF FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *This study examines the applied aspects of results-oriented education in improving the didactic training of future primary school teachers. The research emphasizes the importance of organizing educational processes based on clearly defined goals, measurable outcomes, and effective pedagogical strategies. The study analyzes the theoretical foundations of results-oriented education and identifies major challenges in traditional educational systems, including insufficient management of learning outcomes, subjective evaluation methods, and inconsistencies in educational planning. Using theoretical analysis, comparative analysis, generalization, and pedagogical forecasting methods, the article explores the role of diversification, strategic planning, and results management in strengthening teacher preparation. The findings indicate that results-oriented education contributes to the development of pedagogical competencies, professional responsibility, practical teaching skills, and learner-centered approaches. Furthermore, the study highlights the significance of evidence-based decision-making, continuous monitoring, and feedback mechanisms in ensuring educational effectiveness. The research concludes that results-oriented education serves as an important mechanism for improving the quality and effectiveness of primary teacher education.*

Keywords: *results-oriented education, didactic training, future primary school teachers, pedagogical competence, educational effectiveness, diversification, learning outcomes, teacher preparation, educational strategy, pedagogical forecasting.*

Introduction

The fact that the pedagogical possibilities of results-oriented education have not been sufficiently studied has led to the implementation of additional measures intended to increase efficiency in the traditional educational process. These include, for example, changes connected with the reprinting or new publication of textbooks, the need to continuously improve new interactive information and educational resources as modern information technologies develop, and the demand for new skills from learners under conditions of educational modernization. As a result, new requirements are being imposed on participants in the educational process, gaps are emerging in the professional training of pedagogical personnel, and additional resources are being attracted by the state. In addition, in the traditional education system, the development of education strategies in relation to the previous period, together with the complexity that arises in the timely management of new requirements and needs, demonstrates the necessity of results-oriented education. This, in turn, indicates the need for an integral mechanism characteristic of results-oriented education.

Literature Review

According to P. I. Pidkasistyi, activity of any kind is a system consisting of the following main components: the content aspect, that is, knowledge expressed in the form of concepts, representations, and ideas; the practical aspect, that is, actions in the form of skills and methods used in planning external and internal actions; and the result-oriented aspect, that is, new knowledge, solutions, new social experience, ideas, views, abilities, and personal qualities [9]. Reliance on the principles of effectiveness lies on the boundary between reality and unreality [2].

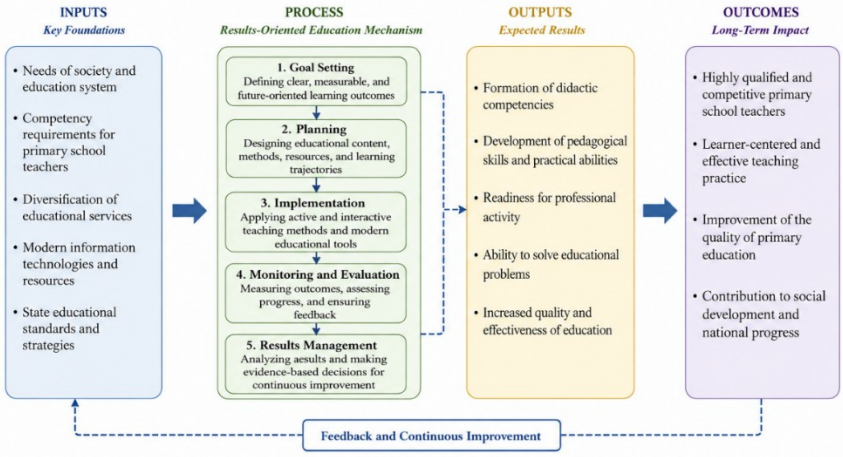
At present, specific tasks are being carried out in order to organize results-oriented education. However, the issues of applying trends in the introduction of results-oriented continuous education remain relevant and, at the same time, require ongoing inquiry. According to the analysis, it should be stated that research must focus on studying the need to use a results-oriented education system; mastering foreign experience in results-oriented education; assessing the need to direct the educational process toward goals of significant importance; and analyzing inconsistencies in the field of the traditional education system and developing ways to eliminate them.

Methodology

This study is based on theoretical and analytical research methods. The research used analysis of pedagogical literature, comparative analysis, generalization, and pedagogical forecasting to examine the applied aspects of result-oriented education in improving the didactic preparation of future primary school teachers.

Figure 1

Conceptual Framework for Applying Results-Oriented Education to Improve the Didactic Training of Future Primary School Teachers



Note. This figure presents a conceptual framework illustrating how results-oriented education can be applied to improve the didactic training of future primary school teachers.

Results and Discussion

The following may be identified as shortcomings of results-oriented education: an insufficiently formed system for managing results; the subjective prognostic activity of the results-management system; the subjectivity of goals, measurements of results, and assessment methods; and the absolute and neutral characterization of the developed strategies.

The following may be listed as solutions to these issues:

1. Clarifying the factors that determine effectiveness

In order to ensure the effectiveness of reforms in education, it is first necessary to determine the activity trajectories of educational subjects on the basis of educational conditions grounded in clearly planned outcomes. Under conditions of diversification, educational services undergo

transformation. It is natural that changes taking place in the socio-economic, political, cultural, and spiritual life of society under conditions of diversification also affect activity in higher education. Considering a properly organized educational process under diversification as a factor in preparing students for pedagogical activity [5] requires examining the features of diversification conditions.

The term diversification is derived from Latin: diversificatio, from diversus, meaning different, and facere, meaning to perform or to do; it denotes expansion and multiplication [1].

Vikhansky (1998) regarded diversification as an organization's strategy of growth and development [8]. Pitts and Hopkins (1982) considered diversification to mean engaging in several types of activity at the same time [6].

Summarizing the research, it should be noted that diversification is a process related to a change in an organization's product. In this context, it is appropriate to understand the organization as an educational organization and the product as the educational result. The issue of diversification is more often considered in the study of social processes and is described as a strategy for developing the process of providing services aimed at achieving results-oriented education.

The following features of diversification are also directly connected with educational processes: the capacity of an educational organization to develop and provide new educational services for new markets; the compatibility of the development strategy of the organization and society; the provision of new educational services by an educational organization in accordance with diversification conditions alongside its internal growth; the fact that new educational services lead to changes in the management structure and management processes of the education system; and the strengthening of the education system's links with other branches and sectors.

The main principles of the diversification process in education are identified as constant changeability, person-centeredness, alternative variability, humanism, and innovation [4].

A. A. Thompson and A. J. Strickland define diversification as the process by which an organization enters other industries. They indicate the following types of diversification strategies [10]: 1. Centralized, or concentric. 2. Traditional. 3. Vertical. 4. Conglomerate, or lateral.

This can be considered in relation to the education system as follows: 1. Centralized, or concentric diversification - the offering of new educational services is aimed at increasing the activity of the educational organization. 2. Traditional diversification - the offering of new educational services is determined by demand, and the main goal is consumer orientation. 3. Vertical diversification - the involvement of modern technologies and tools that serve the development of the education system. 4. Conglomerate, or lateral diversification - the educational organization's offering of types of services not directly related to the field of education in order to ensure its prospective development.

2. Organizing the activity of the results-management system on the basis of objective goals

The effectiveness of the process of modernizing education depends to a large extent on the clarity and validity of the goals that have been set. Results-oriented education is based not on causes but on results and established goals. According to David Osborne, "In order to achieve the intended goals, it is necessary to determine a general measure of the intended results." His ideas are reflected in the following points [3]: results that can be measured must be implemented; if results are not measured, you cannot know your success or failure; if you cannot know your results, you cannot expand them as needed; if you cannot expand your results, you cannot develop a tendency toward progress by expanding effectiveness instead of ineffectiveness; if you do not have the

opportunity to identify your results, you cannot draw the necessary conclusions from them; if work is carried out without drawing conclusions, you cannot eliminate situations that may arise; and if you cannot manage your results, you cannot gain the support of society.

Goal setting is the identification of didactic tasks and the formation of learning outcomes. It is a main factor of pedagogical activity and directs the joint activity of the teacher and the learner toward a common result [7].

3. Developing a results-oriented education strategy

The development of a results-oriented education strategy includes the following: defining targeted program tasks - planning; managing goals - organization; assessing efficiency indicators in the implementation of targeted programs and developing reporting forms on the work carried out - implementation. Assessment of the effectiveness of organizing results-oriented education is based on the qualitative, quantitative, and procedural justification of the results; in planning the educational process, it is considered subjective on the basis of data concerning the results and the main areas of activity of the subjects. Effectiveness becomes evident when the result coincides with the goal that has been set. Effectiveness is connected with the following factors: increasing the responsibility of participants in the results-management system and developing a comprehensive set of activities for achieving a results-oriented education system.

The following may be listed as the possibilities of results-oriented education: orientation toward results establishes clear goals and responsibility among educational subjects; it encourages cooperation aimed at achieving specific results; it ensures the functional distribution of the duties of participants in the results-oriented education system within a strategic activity program; and it ensures that the functional duties of participants in the results-oriented education system are directed toward the development of society.

The functions of results-oriented education are as follows: diagnostic - identifying result-related aspects; evaluative - showing the effectiveness of activity results; monitoring the course and results of the educational process; analyzing the course and results of the educational process; developing the content of reports on results and the rules for their formalization; forecasting subsequent steps in advance; forming clear perceptions among educational subjects regarding results; carrying out rapid statistical processing of the results of the educational process; indicating possible consequences that may occur as a result; involving educational subjects in active discussion of results; increasing learners' responsibility and independence for results; determining the correspondence and compatibility between learners' real knowledge and skills in practice and the requirements, norms, and normative documents established for the results of learning activity; drawing conclusions about the results of learners' learning activity; identifying quantitative indicators that characterize the course and results of the educational process; monitoring whether the results have been correctly determined; ensuring interrelations between the educational process and the production process by examining the course and results of each; taking into account not only the results but also the specific characteristics of learners during the course of the educational process; developing mechanisms that guarantee the results of the educational and upbringing process; regularly introducing forms, methods, and tools that produce positive results into practice; monitoring the constancy and dynamics of positive results; bringing the course of processes and results under control; ensuring the acquisition of new skills and competencies by learners and sufficient development - personal, professional, and social - on the basis of diagnostics of results, whether current, interim, or final; creating a learning environment that ensures effective results; developing a mechanism for organizing the process on the basis of evaluating not only specific

directions in achieving the result but also the influence of additional directions; and correcting and adapting results in accordance with diagnostics. Thus, results-oriented education serves not only the targeted preparation of future primary school teachers but also the identification of their "zone of responsibility" for educational results in their professional activity.

Conclusion. As a process, the strategy of "results-oriented education" is implemented step by step: the clarification stage - studying, analyzing, and evaluating optimal options for organizing the pedagogical process; considering specific facts on the basis of general rules; selecting a set of necessary forms, methods, and tools for implementing the strategy; identifying and clearly defining long-term goals and tasks; the modeling stage - developing a program of tactical measures necessary for creating a strategic project model based on the formed strategic goal; developing the strategy of "results-oriented education" and creating its various structural and content-based strategic models; the implementation stage - carrying out activities on the basis of the selected model in order for the teacher and the student to fulfill the pedagogical tasks that have been set; and the regulation stage - monitoring the fulfillment of the main goal at all stages by means of pedagogical diagnostics and making the necessary corrections. It can be said that results-oriented education requires taking into account the measurability and precision of the results achieved, as well as making evidence-based decisions.

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ORGANIZATION OF THE DIGITAL EDUCATIONAL ENVIRONMENT IN THE TRAINING OF RUSSIAN LANGUAGE TEACHERS

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Abstract. *This article examines the organization of a digital educational environment in the professional training of future Russian language teachers. It analyzes the theoretical, methodological, and pedagogical foundations of integrating digital technologies, electronic educational resources, multimedia tools, online platforms, and virtual classrooms into teacher education. The study emphasizes that a digital educational environment should not be understood merely as a set of technical instruments, but as an integrative didactic system that transforms the structure, content, and methods of instruction. Special attention is given to the development of digital competence, pedagogical content knowledge, independent learning skills, interactivity, and individualized learning paths. The article also discusses the role of digital platforms in strengthening collaboration, improving feedback, and increasing the quality of educational outcomes. The findings suggest that the effective organization of a digital educational environment is essential for preparing competent, flexible, and innovative Russian language teachers for modern educational practice and research today.*

Keywords: *digital educational environment, Russian language teachers, teacher education, digital competence, information and communication technologies, electronic educational resources, methodology, innovative education, professional competence, digitalization of education.*

INTRODUCTION

In the context of globalization and rapid digital transformation, the modernization of the education system—particularly the training of future teachers in accordance with contemporary requirements—has become one of the most urgent scientific and pedagogical issues. Within this process, the effective organization of a digital educational environment plays a crucial role in enhancing the quality of training of Russian language teachers, developing their professional competencies, and implementing innovative approaches in the educational process. A digital educational environment is understood as an integrative system that ensures interaction among participants in the educational process and incorporates electronic educational resources, multimedia tools, information and communication technologies, and online platforms. Such an environment contributes to the formation of future Russian language teachers' information and communicative competence, expands opportunities for independent learning, and supports the individualization of the educational process.

At the same time, the increasing use of digital technologies in education necessitates a reconsideration of pedagogical processes, the development of new methodological approaches, and the improvement of the content of teacher training programs. In particular, the scientific study of the role and significance of the digital educational environment in the preparation of Russian language teachers has become one of the key tasks of contemporary educational research.

LITERATURE REVIEW AND METHODOLOGY

The issue of organizing a digital educational environment in the training of Russian language teachers is considered one of the important directions of modern pedagogical research. The analysis of existing scientific sources shows that in the context of digital transformation, the content, forms, and methods of teacher education are undergoing significant changes. In scientific literature, the digital educational environment is interpreted as an integrative pedagogical system. It combines information and communication technologies, electronic educational resources, virtual platforms, and multimedia tools within the educational process. This contributes to a qualitatively new level of professional training for future teachers.

In particular, the development of digital competence in teacher education has been extensively studied within the field of Educational Technology. At the same time, studies in the field of Teacher Education have developed systems of professional skills necessary for future teachers to function effectively in a modern information environment. Sources on Russian language teaching methodology emphasize that the use of digital technologies helps to individualize the learning process, increase interactivity, and enhance students' motivation. It is also noted that online platforms and digital courses expand opportunities for independent learning.

The literature analysis shows that a digital educational environment should be viewed not merely as a set of technical tools, but as a didactic system that restructures the entire pedagogical process.

In this article, a range of scientific methods was used to explore the essence of the problem:

1) **System approach** — the educational process was analyzed as an integrated pedagogical system.
2) **Content analysis** — scientific literature on digital education and Russian language teaching was studied.
3) **Comparative analysis** — traditional and digital educational environments were compared.
4) **Modeling method** — a conceptual pedagogical model of a digital educational environment was developed.
5) **Observation and generalization** — practical experience of using digital technologies in education was analyzed.

In this article, based on a system approach, the components of the digital educational environment (platforms, resources, methods, and forms of activity) were studied in their interconnection. This allowed for substantiating an integrative approach to the training of Russian language teachers. Furthermore, in this article, pedagogical modeling was used to define the functional structure of the digital educational environment, its impact on improving educational quality, and its role in developing professional competence.

RESULTS

Within the framework of this article, the theoretical and methodological aspects of organizing a digital educational environment in the training of Russian language teachers were analyzed, leading to the following key findings.

First, it was established that the digital educational environment is not merely a collection of technical tools, but an integrative didactic system that fundamentally restructures the educational process. This approach is also supported in the field of Educational Technology. In particular, constructivist ideas associated with scholars such as B. Bloom and J. Bruner emphasize

that active learner participation and the presence of an interactive learning environment significantly enhance learning effectiveness.

Second, it was substantiated that the digital educational environment plays a crucial role in the formation of professional competencies of future Russian language teachers. This idea is consistent with E. Shulman's Pedagogical Content Knowledge (PCK) model within Teacher Education. According to this model, a teacher must not only master subject knowledge but also possess effective methods of teaching it.

Third, the article demonstrated that the main components of the digital educational environment (electronic platforms, multimedia resources, online courses, and virtual classrooms) should function as an interconnected system. This approach aligns with L. Vygotsky's sociocultural theory, which emphasizes the importance of collaboration and social interaction in the learning process. In addition, the results indicate that the digital literacy of teachers is a decisive factor in the effective organization of a digital educational environment. UNESCO recommendations also highlight teachers' digital competence as one of the key requirements of 21st-century education systems.

ANALYSIS

The analysis conducted within this article demonstrates that the implementation of a digital educational environment in the training of Russian language teachers functions as a complex pedagogical factor that enhances the quality of education. Unlike the traditional educational system, the digital educational environment creates conditions for the individualization of the learning process, the enhancement of interactivity, and the expansion of opportunities for independent learning.

The findings indicate that the effectiveness of a digital educational environment depends on the coherence of its structural components. In particular, when electronic learning platforms, multimedia resources, and online courses are integrated, an active learning environment is formed. This aligns with contemporary perspectives in the field of Educational Technology. Furthermore, the analysis revealed that digital competence plays a crucial role in the professional training of future Russian language teachers. A modern educator is expected not only to possess subject knowledge but also to effectively use digital tools, manage electronic learning environments, and apply interactive teaching methods. This approach is supported by research in the field of Teacher Education.

The main features of digital transformation in education include:

1. **Flexibility and accessibility of learning.** One of the key features of digital transformation is increasing the accessibility of education. Thanks to the use of online platforms, distance learning, and mobile technologies, the learning process becomes more flexible and convenient for learners.
2. **Personalization of the learning process.** Digital technologies make it possible to create individual learning paths adapted to the needs of each student. This significantly increases the effectiveness of learning, as each learner can study at their own pace.
3. **Interactivity and multimedia.** The use of multimedia materials such as videos, animations, infographics, and interactive exercises makes the educational process more engaging and diverse. These materials ensure deeper understanding of the subject, stimulate students' interest, and improve learning by engaging different sensory channels.

4. **Enhanced feedback.** Digital technologies enable fast and detailed feedback between teachers and students. They help teachers assess results more quickly and provide recommendations, while students can receive timely answers to their questions.

The results of the analysis also show that a digital educational environment strengthens interaction and collaboration between teachers and students. This corresponds to Vygotsky's sociocultural theory, which emphasizes the collaborative nature of knowledge construction. At the same time, the immediacy of feedback mechanisms in a digital environment enables more effective monitoring of the learning process.

Conclusion

In conclusion, the effective organization of a digital educational environment is a necessary condition for improving the professional training of future Russian language teachers. The study confirms that such an environment should be regarded not only as a technological platform, but also as an integrated pedagogical system that changes the content, methods, and forms of education. Digital tools, electronic resources, multimedia materials, online courses, and virtual classrooms create opportunities for flexible learning, individualization, interactivity, collaboration, and immediate feedback. They also support the development of digital competence, methodological thinking, and independent learning skills among future teachers. At the same time, the success of digital education depends on the purposeful integration of technologies with pedagogical objectives and teacher training content. Therefore, the digital educational environment must be systematically designed, methodologically grounded, and continuously improved in order to prepare competent, creative, and innovative Russian language teachers for modern educational practice and future research.

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INTEGRATION MECHANISMS IN THE FORMATION OF COHESION IN PRIMARY SCHOOL STUDENTS THROUGH ACTIVE GAMES

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Abstract. *This article examines the pedagogical and psychological mechanisms of developing social cohesion among primary school students through active games. The study highlights the importance of integrating collaborative игровые activities into the educational process in order to strengthen communication skills, mutual support, teamwork, and emotional interaction among children. Active games are analyzed as an effective educational tool that promotes social adaptation, collective responsibility, and interpersonal cooperation. The article also discusses the role of teachers in organizing integrative игровые environments and creating favorable conditions for the formation of group cohesion in primary education.*

Keywords: *active games, social cohesion, primary education, integration mechanisms, teamwork, communication skills, child development, cooperative learning.*

Introduction

Modern educational systems increasingly emphasize not only academic achievement but also the social and emotional development of learners. In primary education, the formation of cohesion among students is considered one of the essential conditions for successful learning and healthy personality development. Cohesion refers to the ability of individuals within a group to interact harmoniously, cooperate effectively, and maintain positive interpersonal relationships.

Primary school age is a particularly sensitive period for the development of social skills because children actively learn patterns of communication, cooperation, and emotional interaction. At this stage, active games play a significant role in shaping collective behavior and strengthening interpersonal connections. Through participation in group-based activities, children learn to follow rules, respect others, solve conflicts, and work toward common goals.

The integration of active games into educational practice contributes not only to physical development but also to the establishment of a positive socio-psychological environment in the classroom. Therefore, studying the mechanisms through which active games foster cohesion among primary school students remains an актуальный issue in contemporary pedagogy.

Theoretical foundations of cohesion in primary education

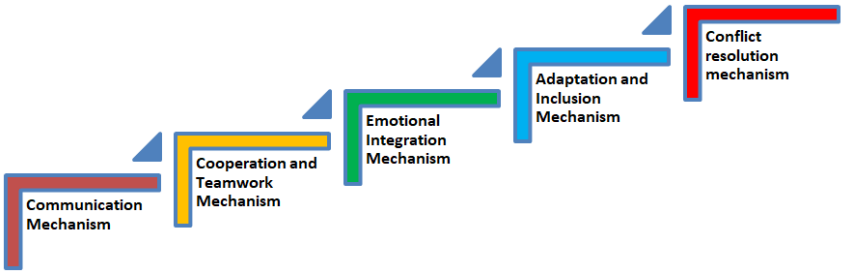
Cohesion in a school environment is understood as the level of unity, trust, emotional closeness, and cooperation among members of a group. Educational psychologists emphasize that cohesive student groups demonstrate higher levels of motivation, participation, and academic engagement.

According to social learning theory, children develop social behavior through observation, imitation, and interaction with peers. In this context, active games function as a natural medium for socialization. During gameplay, students communicate continuously, negotiate rules, distribute responsibilities, and coordinate collective actions. These processes contribute to the formation of mutual understanding and social integration [1, 283].

Researchers in child psychology also note that cooperative play activities reduce feelings of isolation and anxiety among younger learners. Participation in shared physical activities encourages emotional openness and increases the sense of belonging within the classroom community.

Integration Mechanisms in Active Games

The formation of cohesion through active games occurs through several interconnected pedagogical and psychological mechanisms.



Communication mechanism. Active games create situations in which children are required to communicate constantly with their peers. Verbal interaction during games develops listening skills, dialogue culture, and the ability to express thoughts clearly. Through cooperative communication, students gradually learn the principles of respectful interaction and collective problem-solving.

For example, team relay games require children to coordinate actions, exchange information, and encourage one another. Such communication strengthens interpersonal trust and creates a supportive group atmosphere [5, 521].

Cooperation and teamwork mechanism. Most active games are based on collective participation. Team-oriented activities teach children to work together toward a common objective. Students begin to understand that group success depends on the contribution of each participant.

In games such as “Capture the Flag” or cooperative obstacle challenges, children learn to distribute roles, assist weaker teammates, and coordinate strategic decisions. These experiences contribute to the development of responsibility, solidarity, and mutual dependence.

Emotional integration mechanism. Active games generate positive emotional experiences that strengthen social bonds among participants. Shared joy, excitement, and success create emotional unity within the group.

Positive emotions experienced during gameplay help reduce interpersonal barriers and encourage empathy among students. Children become more willing to support classmates and develop friendly relationships based on trust and emotional closeness.

Adaptation and inclusion mechanism. Active games also support the social adaptation of shy or less socially active children. Inclusive group activities provide opportunities for all students to participate regardless of their academic abilities or social status [4, 2205].

When teachers organize games that emphasize cooperation rather than competition, children with different personalities and abilities feel equally valued within the group. This approach promotes inclusivity and prevents social exclusion in the classroom.

Conflict resolution mechanism. During games, disagreements and misunderstandings naturally emerge. However, under proper pedagogical guidance, such situations become opportunities for students to learn constructive conflict resolution strategies.

Children gradually acquire skills of negotiation, compromise, and emotional regulation. As a result, active games contribute to the development of social tolerance and respectful peer relationships [5, 522].

In the process of developing cohesion among primary school students, the teacher occupies a central pedagogical and psychological position. Modern educational approaches emphasize that the effectiveness of active games depends not only on the structure of the activity itself but also on the professional guidance provided by the teacher. Within the educational environment, the teacher functions not merely as an organizer of physical activities, but also as a facilitator of social interaction, emotional regulation, and collective communication among learners.

The teacher's role in fostering cohesion is particularly significant during primary education because children at this age are still developing essential interpersonal skills, including cooperation, empathy, self-control, and communication competence. Through properly organized active games, teachers can create favorable conditions for the formation of positive peer relationships and collective responsibility. In this context, pedagogical guidance becomes an important mechanism for transforming ordinary gameplay into a meaningful educational experience [4, 2210].

One of the primary responsibilities of the teacher is the selection of age-appropriate cooperative games. Games must correspond to the cognitive, emotional, and physical characteristics of children in order to ensure active participation and psychological comfort. Activities that are excessively difficult or highly competitive may create tension, frustration, or social inequality among students. Therefore, teachers should carefully choose games that encourage collaboration, mutual assistance, and shared achievement rather than individual dominance.

Another essential function of the teacher involves ensuring equal participation among all students. In many classroom situations, socially active or physically strong children tend to dominate group activities, while shy or less confident students may become passive observers. Effective teachers create inclusive conditions in which every child has the opportunity to contribute to the collective task. Such pedagogical practices promote social inclusion and strengthen students' sense of belonging within the group.

The creation of an emotionally safe learning environment also represents a crucial aspect of cohesion development. Positive emotional experiences during active games increase trust and openness among students. Teachers should encourage respect, tolerance, and emotional support while preventing ridicule, discrimination, or aggressive behavior. An emotionally supportive atmosphere enables children to express themselves freely and interact with peers without fear of failure or rejection. Furthermore, teachers play an important role in supporting positive communication and teamwork. During cooperative games, students learn to exchange ideas, coordinate actions, negotiate rules, and solve problems collectively. The teacher guides these interactions by modeling respectful communication patterns and encouraging constructive dialogue. As a result, children gradually develop social competence and collaborative skills necessary for successful interpersonal relationships.

An equally important pedagogical task is the prevention of excessive competition and social exclusion. While competition can motivate learners, uncontrolled rivalry may negatively affect group unity and increase interpersonal conflicts. For this reason, teachers should prioritize cooperative and team-oriented activities that emphasize collective success rather than individual victory. Such an approach contributes to the formation of solidarity, empathy, and mutual

responsibility among students. Reflection activities conducted after games also play a significant role in strengthening cohesion. Through reflective discussions, children analyze their experiences, emotions, and interactions during gameplay. Teachers may encourage students to discuss questions related to teamwork, cooperation, problem-solving, and emotional support. Reflection helps learners become aware of the importance of collective effort and reinforces positive social behavior.

Educational Benefits of Active Games. The integration of active games into primary education provides numerous pedagogical advantages:

- improvement of communication and social interaction skills;
- development of empathy and emotional intelligence;
- enhancement of teamwork and leadership abilities;
- reduction of classroom conflicts;
- increased student motivation and participation;
- creation of a positive classroom climate.

Moreover, active games support both cognitive and physical development, making them a multifunctional educational tool in modern pedagogy.

Conclusion. The formation of cohesion among primary school students represents an essential component of successful educational practice. Active games serve as an effective pedagogical mechanism for strengthening communication, cooperation, emotional integration, and social adaptation among children. Through collective participation in games, students acquire valuable interpersonal skills that contribute to the creation of a supportive and harmonious classroom environment. The study demonstrates that integration mechanisms such as communication, teamwork, emotional interaction, inclusion, and conflict resolution play a decisive role in developing group cohesion. Therefore, the systematic incorporation of active games into primary education should be regarded as an important strategy for promoting both social and educational development in children.

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BEYOND PLAY: HEURISTIC GEOMETRIC MODELING AS A DIAGNOSTIC TOOL FOR LOGICAL-MATHEMATICAL SCHOOL READINESS

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Abstract. *The transition from early childhood to formal schooling requires the development of robust logical-mathematical readiness. This article presents a methodological framework for utilizing constructive geometric materials—specifically, the "Tangram" and "Pythagoras" puzzles—as heuristic tools to cultivate spatial reasoning, algorithmic thinking, and early engineering concepts in preschool children (ages 6–7). By progressing through a structured, five-phase pedagogical intervention ranging from basic morphological synthesis to free heuristic simulation, educators can transform abstract mathematical concepts into tangible, flexible tools for understanding the physical world. Empirical observations indicate that systematic engagement with these materials enhances children's observational acuity, spatial visualization, and independent cognitive planning.*

Keywords: *preschool education, mathematical modeling, heuristic technologies, algorithmic thinking, logical-mathematical readiness, spatial reasoning, early engineering.*

1. Introduction

The cognitive development of preschool children is heavily reliant on their active engagement with their environment. In the context of early mathematical education, rote memorization of geometric principles is insufficient for cultivating the complex problem-solving skills required in modern educational paradigms. Instead, heuristic educational technologies—methods that encourage discovery, self-directed learning, and inventive problem-solving—are required to establish a foundation for engineering and creative thinking. [1;2; 4].

This study explores the efficacy of mathematical modeling using planar geometric puzzles (such as the "Tangram") in fostering logical-mathematical readiness in older preschoolers. By manipulating these materials, children do not merely recognize shapes; they actively deconstruct and synthesize them, learning the laws governing the formation of new geometric entities. This hands-on manipulation serves as a crucial bridge between concrete operations and abstract algorithmic thinking. [1].

2. Methodological Framework: A Five-Phase Heuristic Modeling Approach

The proposed methodology operates not merely as a sequence of playful tasks, but as a structured cognitive trajectory rooted in constructivist learning theories and the concept of fading scaffolding. Designed specifically for the developmental psychology of older preschoolers (6–7 years old), this progression systematically guides the child from guided sensory-motor observation to independent, heuristic simulation. This sequence ensures that cognitive load is rigorously managed while progressively challenging the child's spatial, analytical, and early engineering capacities. By moving from explicit instruction to open-ended problem-solving, mathematics is

transformed from a rigid set of rules into a flexible tool for understanding and reconstructing the physical world. [2].

Phase I: Foundational Geometry, Morphological Awareness, and Invariance

The initial phase establishes the sensory and conceptual baseline. It focuses on familiarizing children with the constructive set (e.g., "Tangram", "Pythagoras", or "Fold a Square" materials) and the physical properties of its geometric components. The primary objective is to establish a robust understanding of morphological synthesis—the concept that complex, composite shapes can be generated from a fixed set of simpler constituents. [3].

- Pedagogical Action: Educators facilitate hands-on sensory exploration. Children are tasked with comparing dimensions (e.g., superimposing triangles to verify congruence) and exploring spatial rotation. A critical pedagogical focus here is challenging the child to recognize that a geometric shape retains its intrinsic properties (angles, area, proportions) regardless of its spatial orientation or position on the plane.
- Cognitive Outcome: This phase consolidates foundational geometric vocabulary (quadrilateral, vertices, parallelogram) and initiates the understanding of spatial relationships. More importantly, it solidifies the concept of geometric invariance, an essential prerequisite for mental rotation and proportional reasoning in later engineering tasks.

Phase II: Advanced Morphological Synthesis and Combinatorial Geometry

Once foundational morphological knowledge is secured, the intervention introduces targeted structural transformations and the concept of multi-component polygons. This phase transitions the child from isolated shape recognition to combinatorial geometry. [1;2; 7].

- **Pedagogical Action**: Educators guide children to construct specific, complex targets (e.g., pentagons, trapezoids, hexagons) utilizing 2–4 base pieces. This phase introduces formal visual schemas, shifting the instructional modality from verbal directions to visual-spatial decoding. Crucially, educators prompt children to explicitly verbalize their actions (e.g., "I joined the hypotenuse of the large triangle to the side of the square").
- **Cognitive Outcome:** Children learn to identify and construct composite shapes, developing the ability to translate a 2D abstract schema into a physical, multi-part construction. The requirement for verbalization bridges physical manipulation with linguistic articulation, embedding the physical action into the child's internal logical-mathematical framework. [2; 4, 5].

Phase III: Analytical Reconstruction via Segmented Scaffolding

The third phase introduces early algorithmic logic by challenging children to analyze a dismembered (segmented) silhouette. In these schematics, the internal boundaries of the component shapes are explicitly visible, acting as external cognitive scaffolding.

- **Pedagogical Action:** Using a segmented model of a recognizable object (e.g., a house or a boat), children must visually map their physical planar pieces to the corresponding graphical segments of the provided schema. The educator acts as a facilitator, ensuring the child follows a systematic, step-by-step matching process.
- **Cognitive Outcome**: This exercise cultivates isomorphic visual mapping and part-to-whole relationships. It forces the child to quantify the necessary components and strategically plan their assembly sequence. This sequential planning mirrors early algorithmic logic—deconstructing a macroscopic goal into manageable, microscopic executive steps. [4:7].

Phase IV: Holistic Spatial Mapping and Inverse Problem Solving

Representing a significant leap in cognitive demand, this phase systematically removes the internal visual scaffolding. Children are presented with an undivided, solid silhouette (e.g., a dancing human figure), presenting them with what is essentially a "black box" engineering problem. [2; 6;7].

- **Pedagogical Action:** Children must independently hypothesize the spatial arrangement of the hidden internal components. Educators facilitate this heuristic process not by providing answers, but by prompting analytical dialogue ("From what specific geometric shapes can we construct the torso to achieve this angle? How can we represent the extremities?"). The child is encouraged to formulate a hypothesis, test it physically, and iterate based on the result.
- **Cognitive Outcome:** This requires advanced mental rotation, spatial visualization, and analytical thinking. The child is engaging in "reverse engineering"—decoding a final product to understand its underlying architecture. The ability to mentally manipulate shapes and predict the outcome of a geometric union before executing the physical construction is a fundamental marker of high-level logical-mathematical readiness.

Phase V: Heuristic Free Simulation and Independent Cognitive Planning

The final phase removes all external schemas, transitioning the child entirely to autonomous mathematical modeling. Here, the geometric material ceases to be a puzzle with a predetermined answer and becomes a medium for open-ended design.

- **Pedagogical Action:** Children are tasked with ideating, designing, and constructing original silhouettes based purely on their own intent and imagination. The educator’s role shifts to an observer and evaluator of the child's independent logical processes, making this phase an excellent non-test diagnostic tool for school readiness.
- **Cognitive Outcome:** This phase synthesizes all prior skills. It requires the child to formulate an internal mental plan, execute a self-generated algorithmic series of logical steps to achieve it, and critically evaluate the structural integrity and aesthetic representation of the final product. This free simulation represents the pinnacle of heuristic learning, confirming the successful integration of engineering, algorithmic, and creative thinking.

3. Results and Discussion

The deployment of this phased heuristic methodology demonstrates that constructive geometric materials transcend their traditional role as mere playthings. When applied through a structured pedagogical framework, they function as highly effective instruments for both early mathematical development and cognitive diagnostics. The progression from guided morphological synthesis to free heuristic simulation essentially provides preschool children with a tangible microcosm of the scientific method and the engineering design process. [2; 5; 8].

3.1. The Tangible Scientific Method and Iterative "Debugging"

The heuristic approach proposed in this study effectively maps onto the core tenets of scientific inquiry. When a child is confronted with an undivided silhouette (Phase IV), they engage in continuous hypothesis generation (e.g., mentally predicting how two triangles might form the necessary rectangular base). The subsequent physical manipulation of the shapes serves as empirical testing. [2: 7;8].

Crucially, when a spatial hypothesis fails—when the pieces do not align with the silhouette—the child must engage in iterative correction. In the context of early algorithmic thinking, this

physical trial-and-error is the analog equivalent of "debugging" a sequence of code. This unplugged algorithmic practice teaches children that failure is not a definitive end, but informative feedback within a flexible problem-solving loop. By treating geometric shapes as manipulable variables, children develop the resilience and adaptive logic that characterize true engineering thinking.

3.2. Metacognition Through Linguistic Articulation

A critical component of this methodology is the mandated verbalization of spatial processes. The requirement for children to articulate their actions (e.g., explaining precisely *how* a specific quadrilateral was synthesized from a large and medium triangle) serves a profound developmental purpose. It bridges non-verbal spatial-visual reasoning with linguistic-logical articulation.

Drawing on constructivist theories of cognitive development, this verbalization acts as a catalyst for metacognition. It prevents the child from relying solely on intuitive, accidental successes. By forcing the child to verbally encode their physical actions, declarative knowledge is formed. This transition from "knowing how" (procedural memory) to "knowing that" (declarative memory) is a fundamental pillar of logical-mathematical readiness, ensuring the child is equipped to handle the abstract mathematical symbols introduced in formal schooling.

3.3. Implications for Non-Test Diagnostics of School Readiness

Beyond developmental intervention, this heuristic framework offers significant value for pedagogical assessment. Standardized, quantitative testing often fails to capture the dynamic problem-solving capabilities of children aged 6–7. Constructive materials—whether utilizing the classical "Tangram" puzzle or analogous structured modeling materials like the "Fold a Square" apparatus—serve as exceptional qualitative diagnostic instruments. [3;4;9].

By observing a child navigating Phase III (segmented scaffolding) versus Phase IV (holistic mapping), educators can accurately diagnose specific developmental stages of spatial reasoning, working memory capacity, and algorithmic sequencing. The educator evaluates not just the final product, but the elegance and efficiency of the child's internal logical trajectory. Consequently, heuristic geometric modeling provides a comprehensive, stress-free diagnostic window into a child's holistic logical-mathematical readiness for the primary school transition.

4. Conclusion

Integrating heuristic geometric modeling into preschool curricula offers a dynamic pathway for cognitive development. By treating mathematics not as static facts but as a manipulable toolkit, educators can successfully lay the groundwork for algorithmic processing and engineering thinking. Future research should explore the comparative efficacy of various planar puzzles and their long-term impact on mathematical achievement in primary education.

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METHODS OF INDIRECT PERCEPTION OF LASER RADIATION GENERATION MECHANISMS IN MODERN EDUCATION

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Abstract. *At present, the education system is transitioning from mere transmission of information to the development of students' independent and non-standard thinking skills. In teaching natural sciences, particularly complex fields such as laser physics, the traditional lecture-based approach is often insufficient. In integrating laser physics with modern education, the concept of indirect perception serves to enhance students' understanding of the subject through internal logical connections and visual models. "The traditional pedagogical approach within our national system predominantly focuses on the transmission of ready-made knowledge into the minds and cognition of students. This methodology centers on the memorization and subsequent application of existing information, evaluating student competence primarily based on their retention capacity. Consequently, such an approach fails to serve as a foundation for students to discover new knowledge, thereby hindering the anticipated progress and innovation in science and industry. To address this, it is essential for students to comprehend the core essence of the subject matter, grasp cause-and-effect relationships, and develop independent drawing-conclusion skills. Achieving this necessitates the cultivation of 'non-standard' (out-of-the-box) and critical thinking among the youth.*

Keywords: *indirect perception, direct perception, mind map, lasers, non-standard thinking.*

Main Part. In our daily lives, we see, hear, and cognitively perceive events and phenomena. Some properties of objects are sensed, while others are perceived. Perception is based on the integrative activity of the human brain [1]. Direct knowledge refers to understanding something immediately visible without requiring proof. In natural sciences, particularly physics, many topics require reliance on students' ability to visualize, because they can only be studied indirectly—through results or instruments.

Indirect knowledge is obtained by enhancing sensory perception or facilitating observation [2]. Direct perception, in contrast, is formed through direct observation and experimentation, such as in laser physics studies.

In traditional national pedagogy, teaching often involves transferring ready-made knowledge into students' minds, emphasizing memorization and application. However, such an approach does not provide a foundation for discovering new knowledge, nor does it foster scientific and technological advancement. Therefore, it is essential for students to understand the essence of problems, grasp cause-and-effect relationships, and develop independent reasoning skills. Developing non-standard thinking becomes crucial in this context [3].

Visualization and Constructivism in Laser Physics.

The first pillar of integrating laser physics into modern education is visualized constructivism. The microscopic nature of laser radiation (stimulated emission in atoms) cannot be

directly observed by the human eye. Therefore, the use of interactive simulations and virtual laboratories makes the “invisible visible”.

If students observe dynamic models before mathematical formulations, they develop intuition and non-standard approaches. In 1916, Albert Einstein predicted that radiation emitted during the transition of an electron from a higher to a lower energy level is not always spontaneous. Under the influence of an external electromagnetic field, an excited atom may emit a photon earlier —this is called stimulated emission.

When $h\nu = W_2 - W_1$ a photon interacts with an excited atom, two identical photons are produced with the same energy and direction.

Analogy: “Choral Singing”

Stimulated emission can be compared to a choir:

Process: A group of singers (excited atoms) are waiting on stage.

External influence: A conductor (incoming photon) gives a signal.

Result: All singers begin singing simultaneously, in the same tone and rhythm.

Physical meaning: All emitted photons have identical frequency and phase.



Picture 1. Analogy: “Choral Singing”

In 1960, American physicist Theodore Maiman created the first optical laser device.

LASER = Light Amplification by Stimulated Emission of Radiation

Key explanations for students:

Nature of radiation: A laser does not create light but amplifies existing light.

Difference from ordinary light: Laser photons move in the same direction and are emitted simultaneously under stimulated conditions.

What is Laser Light?

Laser light differs from ordinary light:

Monochromatic (single frequency)

Directional (does not scatter)

Coherent (phase-aligned)

In simple terms, it is highly organized and powerful light.

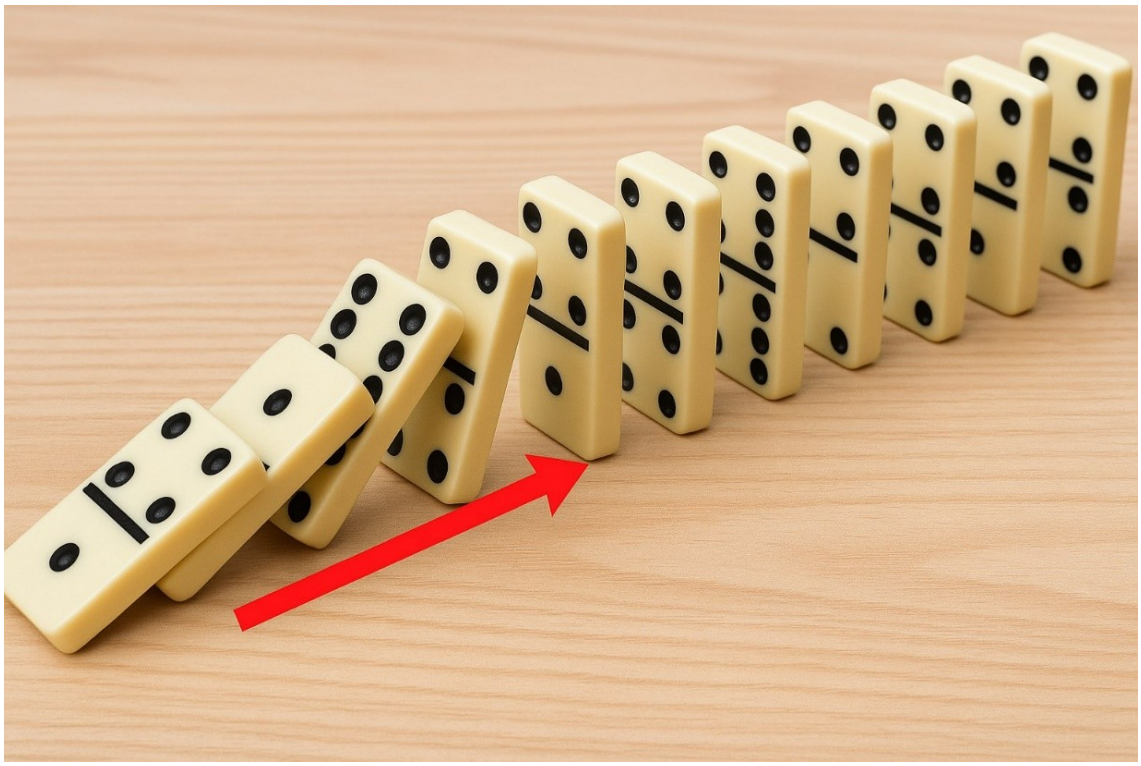
Analogy: Domino Effect (Chain Reaction)

Imagine a row of dominoes:

When the first domino falls, it triggers the next one, creating a chain reaction.

Similarly, in laser mechanisms, one photon interacts with an excited atom, causing it to emit another photon.

Each photon activates another atom, leading to a cascade effect—this is stimulated emission.



Picture 2. Analogy: Domino Effect (Chain Reaction)

Here is the formal academic translation of the essay into English, maintaining its advanced pedagogical and scientific terminology: Expanding the Pedagogical Perspective in Teaching Laser Physics: Developing Non-Standard Thinking Teaching laser physics within the framework of educational theory and methodology requires a shift from traditional instructional models. It serves not merely as a vehicle for transmitting established facts, but as a primary didactic resource for developing **"indirect perception"** and heuristic (creative-exploratory) thinking in students. In traditional physics courses, macroscopic phenomena are often explained through linear, cause-and-effect chains that are directly observable. In contrast, laser physics confronts the student with non-linear, anomalous processes of the microscopic world that cannot be visually perceived. This shift demands intellectual flexibility and the rejection of rigid cognitive stereotypes from the learner.

Within the pedagogical process, fostering non-standard thinking through the study of laser physics comprises several fundamental stages and methodological approaches:

1. Cognitive Dissonance and the Modeling of Problem-Based Situations

The pedagogical trigger for awakening non-standard thinking is the creation of **cognitive dissonance** (a contradiction in the student's mind). Throughout the lesson, the educator designs problem-based scenarios where the phenomena of laser physics appear to contradict the everyday logic of classical optics.

Pedagogical Case: Students are first reminded of the classical principle of superposition: “When two light rays intersect, they pass through each other without interaction”.The educator

then introduces non-linear optical media, demonstrating how high-intensity laser beams can interact, modulate, or even cancel each other out. Such paradoxes compel students to re-evaluate their existing "standard knowledge maps" and utilize indirect perception to delve deeper into the core nature of physical phenomena.

2. The Method of Indirect Perception and Mental Analogies

Because many concepts in quantum mechanics and laser physics (e.g., population inversion, standing waves within a resonator, stimulated emission of photons) belong to the microscopic realm, they cannot be directly observed in a standard laboratory setting. Here, the educator must activate the **mechanism of indirect perception**. In pedagogy, this is achieved by modeling abstract concepts through macroscopic or social systems (the method of mental analogies). For instance, the excitation of atoms across energy levels and the resulting population inversion can be illustrated through non-traditional socio-humanitarian analogies, such as the distribution of economic resources or the synchronous (coherent) alignment of individuals around a shared idea. This approach significantly enhances the student's non-linear, associative thinking capacity.

3. Interdisciplinary Integration (The Methodological Bridge)

The greatest pedagogical strength of laser physics methodology lies in its **transdisciplinary (interdisciplinary)** nature. Non-standard thinking thrives precisely at the intersection and collision of diverse scientific disciplines.

4. Criteria for Evaluating Heuristic and Creative Activity

To maintain pedagogical consistency, the assessment and control system must also be non-standardized. Rather than utilizing conventional multiple-choice tests or rote formula reproduction, students are assigned **"Laser-Based Inventive Tasks"** (incorporating elements of the TRIZ—Theory of Inventive Problem Solving—technology). For example, students might be asked: "How can laser sensors determine the pollution level of a deep underground reservoir without damaging its delicate ecosystem?" Because there is no single "correct answer", assessment focuses on the student's adaptive thinking—specifically, their capacity to creatively adapt fundamental physical laws to unfamiliar, open-ended scenarios.

From a pedagogical standpoint, the laser physics section serves as a fundamental platform for **person-centered and developmental education** within the modern educational paradigm. Teaching this complex field through systemic, problem-based, and integrated methodologies transforms students from passive consumers of information into **non-standard thinking researchers**—individuals capable of analyzing non-linear realities and uncovering innovative, unexpected solutions to complex global problems.

Conclusion. To effectively integrate laser physics into modern education, teaching should incorporate interactive models, real-life examples, and methods that stimulate non-standard thinking. The indirect learning approach allows students not only to memorize complex physical processes but to deeply understand and apply them in practice. This is essential for preparing highly qualified and creative specialists in the digital age. Toward a Non-Linear Paradigm in Higher Pedagogical Education.

In the contemporary paradigm of higher education, the integration of advanced scientific fields with innovative educational methodologies is no longer a peripheral strategy, but a core structural necessity. The structural-functional analysis of the "Laser Physics" section reveals that its value extends far beyond its concrete physical equations or technological applications; it functions as a profound catalyst for cognitive transformation. The interaction between the intricate

laws of quantum optics and the development of non-standard thinking skills forms a dialectical unity that redefines the parameters of modern physics didactics. The expansion of this pedagogical framework yields several critical conclusions for the theory and methodology of professional education:

Epistemological Shift from Linear to Systems Thinking: Traditional physics instruction often reinforces a mechanistic worldview dominated by linear causality. Laser physics, by its very nature (incorporating phenomena such as population inversion, quantum coherence, and non-linear optical responses), forces an epistemological shift. It requires students to operate within a framework of multi-variable probabilities and non-equilibrium states. When properly mediated by an expert educator, this shift directly fosters metakognitive flexibility—the ability to conceptualize complex, non-obvious systems not just in natural sciences, but in real-world problem-solving.

The Didactic Value of Bilvosita Idrok (Indirect Perception): Because the quantum mechanical processes driving laser operation cannot be observed via direct sensory experience, they demand a reliance on advanced mental modeling, heuristic analogies, and abstract cognitive visualization. Elevating **"Indirect Perception"** to a core instructional method allows pedagogy to transcend rote memorization. It trains the student's mind to look past superficial data and identify the underlying, non-linear structures governing a problem, which is the exact definition of inventive, non-standard thinking.

Transdisciplinarity as an Intellectual Substrate: The methodology proposed demonstrates that laser physics acts as a transdisciplinary axis connecting quantum mechanics, medicine, informatics, and materials science. Exposing pedagogy students to this systemic intersection eliminates cognitive compartmentalization. It prepares future educators to design learning environments where students do not merely "consume" physics, but actively "weaponized" its principles to innovate across fluid, evolving industrial and scientific frontiers.

Ultimately, transforming the "Laser Physics" section into a pedagogical laboratory for non-standard thinking redefines the role of the modern researcher and educator. By transitioning from dogmatic, textbook-driven instruction to an open-ended, problem-based, and integrated methodology, higher education can successfully cultivate a new generation of adaptive thinkers. These individuals will be uniquely equipped not only to navigate the non-linear challenges of 21st-century technology but to actively shape the scientific and educational landscapes of tomorrow.

In conclusion, the teaching of laser radiation generation mechanisms in modern education requires a transition from traditional information-based instruction to methods that develop students' independent, critical, and non-standard thinking. Since many processes in laser physics, such as stimulated emission, population inversion, coherence, and photon amplification, cannot be directly observed, the method of indirect perception becomes especially important. Through visual models, mental analogies, simulations, and problem-based learning situations, students are able to understand complex microscopic phenomena more deeply and meaningfully.

The use of analogies such as "choral singing" and the "domino effect" helps transform abstract quantum processes into understandable cognitive models. This approach supports not only memorization but also the formation of logical reasoning, scientific imagination, and creative problem-solving skills. Furthermore, the integration of laser physics with interdisciplinary fields such as medicine, information technology, engineering, and materials science expands students' worldview and strengthens their ability to apply scientific knowledge in unfamiliar contexts.

Thus, laser physics can serve as an effective pedagogical platform for developing heuristic and non-standard thinking in students. The combination of indirect perception, interactive

technologies, visualization, and problem-based tasks allows learners to move from passive reception of knowledge to active scientific inquiry. Therefore, the modernization of physics education should include methods that make invisible processes understandable, encourage independent conclusions, and prepare creative specialists capable of solving complex scientific and technological problems in the digital age.

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A CRITERIA-BASED METHODOLOGY FOR DEVELOPING EFL STUDENTS' CRITICAL THINKING COMPETENCE UNDER SUMMATIVE ASSESSMENT CONDITIONS

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Abstract. *The article develops a criteria-based methodology for integrating critical thinking competence into summative assessment in English as a foreign language instruction. The central problem is the methodological tension between language accuracy, which is traditionally prioritised in summative tests, and higher-order reasoning, which requires interpretation, evidence evaluation, inference and justified argumentation. Using a design-oriented methodological approach, the study maps critical thinking components onto EFL communicative tasks and formulates an analytic rubric suitable for end-of-unit or end-of-course assessment. The proposed methodology combines constructive alignment, CEFR-oriented communicative descriptors, task authenticity and transparent scoring criteria. The results present a three-stage instructional-assessment cycle, a construct map and a rubric that differentiates task fulfilment, evidence-based reasoning, argument quality and language performance. The article argues that summative assessment can support critical thinking development when assessment tasks require learners to analyse unfamiliar input, compare perspectives, formulate reasoned positions and justify conclusions in English.*

Keywords: *critical thinking, summative assessment, English as a foreign language, analytic rubric, criteria-based methodology, higher-order thinking, assessment validity.*

INTRODUCTION

Critical thinking competence has become one of the central educational outcomes in contemporary language education because learners are expected not only to understand linguistic forms but also to interpret information, evaluate arguments, justify decisions and participate in reasoned communication. In English as a foreign language instruction, this competence acquires a specific methodological character: the learner must process information through a developing linguistic system and express an intellectually defensible position in a non-native language. Therefore, critical thinking in EFL cannot be reduced to a general cognitive skill detached from language. It must be operationalised through reading, listening, speaking and writing tasks in which evidence, reasoning and linguistic expression function as a unified learning construct.

Summative assessment creates a particularly complex context for the development of critical thinking. In many classroom practices, final tests, end-of-unit examinations and course examinations tend to measure vocabulary, grammar, reading comprehension and controlled written production more frequently than interpretation, inference or evaluation. This tendency is understandable because discrete language items are easier to score reliably. Nevertheless, when summative assessment rewards mainly recall and reproduction, it narrows the educational meaning of EFL learning and weakens the positive washback of assessment. The challenge is not to replace language assessment with abstract reasoning tasks, but to design assessment situations where language performance and critical judgement become mutually reinforcing dimensions.

The theoretical basis of the present article is formed by three interrelated lines of scholarship. First, critical thinking research conceptualises competent thinking as interpretation, analysis, inference, evaluation, explanation and self-regulation, together with dispositions such as intellectual honesty, openness to alternatives and reasoned judgement (Facione, 1990; Ennis, 2011). Second, classroom assessment research emphasises that higher-order thinking requires tasks based on novel material, transparent criteria and opportunities to construct explanations rather than merely select answers (Brookhart, 2010). Third, language assessment theory insists that useful tests must be valid, reliable, authentic, interactive and appropriate to the intended communicative domain (Bachman & Palmer, 1996; AERA, APA, & NCME, 2014). These approaches show that critical thinking can be assessed in EFL only when the construct is specified precisely and the scoring procedure is aligned with the communicative objectives of the course.

The purpose of this article is to develop a criteria-based methodology for developing EFL students' critical thinking competence under summative assessment conditions. The article addresses the following research questions: which components of critical thinking are methodologically relevant for EFL summative assessment; how summative tasks can be designed to elicit evidence-based reasoning in English; and which criteria can support fair scoring of both language performance and critical thinking quality. The expected contribution is a methodological framework that can be used by teachers, curriculum designers and researchers when designing end-of-module assessment tasks in English language courses.

MATERIALS AND METHODS

The study uses a design-oriented methodological approach rather than an experimental design. Its aim is to construct a pedagogically grounded assessment model and to specify criteria that may later be tested empirically in classroom or quasi-experimental research. The methodological procedure consisted of four stages: theoretical analysis of critical thinking constructs; alignment of critical thinking components with EFL communicative skills; construction of summative assessment task types; and formulation of an analytic rubric for criteria-based scoring.

The conceptual materials included established sources on critical thinking, higher-order thinking assessment, language assessment and constructive alignment. The Delphi Report by Facione was used to define the core cognitive operations of critical thinking, while Ennis's outline of dispositions and abilities helped distinguish cognitive procedures from learner attitudes. Brookhart's principles for assessing higher-order thinking informed the requirement that summative tasks should use unfamiliar input and require explanation, judgement or argument. The CEFR Companion Volume provided a communicative orientation for linking tasks with language use, especially through reception, production, interaction and mediation. Principles of assessment validity and reliability were taken from the Standards for Educational and Psychological Testing and from language testing theory.

The construct mapping procedure followed the logic of constructive alignment. First, expected outcomes were expressed as observable learner performances: identifying a claim, distinguishing evidence from opinion, comparing perspectives, drawing an inference, evaluating credibility and producing a justified response in English. Second, these outcomes were linked to assessment tasks that could be administered summatively, for example source-based written response, argumentative speaking, problem-based reading task, comparative listening task and integrated reading-writing task. Third, each task was connected to analytic scoring criteria so that the teacher could evaluate both the quality of reasoning and the quality of English language use.

This procedure reduces construct underrepresentation because critical thinking is not left as a vague educational value; it becomes a set of observable indicators within language performance.

The proposed methodology is intended for B1–B2 level EFL students, although the task complexity and linguistic demands can be adjusted for other levels. It assumes that summative assessment is preceded by regular formative preparation, including discussion, text analysis, argument mapping and guided reflection. However, the summative task itself must contain a new text, problem or communicative situation so that students demonstrate transferable competence instead of reproducing previously memorised material. This distinction is essential for assessing critical thinking fairly.

Table 1. Construct map for criteria-based assessment of critical thinking in EFL

Critical thinking component	Observable EFL performance	Suitable summative task	Evidence for scoring
Interpretation	Identifies the issue, claim or problem in a text or oral input	Reading or listening task with short written explanation	Accurate statement of the central issue and relevant contextual detail
Analysis	Separates reasons, examples, assumptions and counter-arguments	Source-based written response	Clear distinction between fact, opinion, evidence and assumption
Inference	Draws a justified conclusion from available information	Problem-solving discussion or written decision task	Conclusion supported by textual or situational evidence
Evaluation	Judges reliability, relevance and sufficiency of evidence	Comparative text analysis	Reasoned evaluation of source quality and argument strength
Argumentation	Constructs a coherent position in English	Argumentative essay or oral defence	Claim, evidence, reasoning, counter-position and conclusion
Self-regulation	Recognises limitation, bias or alternative explanation	Reflective paragraph after summative response	Revision of judgement or acknowledgement of uncertainty

RESULTS

The first result of the methodological design is a three-stage instructional-assessment cycle. The cycle begins with criteria orientation, continues through guided critical practice and finishes with a summative performance task. At the orientation stage, students become familiar with the criteria of reasoning quality, not only with the grammatical requirements of the final task. The teacher explains how claims, evidence, assumptions, counter-arguments and conclusions will be recognised in the assessment. This stage is not a rehearsal of the final answer; it is a conceptual preparation that makes the assessment criteria transparent.

The guided practice stage develops the operations that will later be assessed summatively. Students analyse short texts, identify implicit assumptions, compare two positions, formulate questions, evaluate examples and practise giving reasons in English. The teacher provides feedback on both language and reasoning. A typical sequence may include a pre-reading question, a source credibility check, a claim-evidence-reasoning chart, a short oral debate and a reflective note. The purpose is to make critical thinking visible through language activity. Without such practice, summative assessment of critical thinking becomes unfair because students are evaluated on a competence that has not been systematically taught.

The summative stage requires students to work with new material. For example, students may read two short texts presenting different views on the use of artificial intelligence in education and write a structured response in which they identify the stronger argument, justify their choice with evidence and recognise one limitation of their own position. Another variant may involve listening to a short interview and preparing a two-minute oral response that distinguishes facts from opinions and proposes a reasoned decision. The essential requirement is that the task should be linguistically accessible yet cognitively demanding. A task becomes valid for critical thinking assessment only when students must make a judgement, not merely locate information.

The second result is the formulation of a criteria-based analytic rubric. The rubric separates but connects four domains: task fulfilment, critical reasoning, communicative organisation and language control. Task fulfilment measures whether the student addresses the required communicative situation. Critical reasoning measures interpretation, analysis, inference, evaluation and justification. Communicative organisation measures coherence, cohesion, paragraph logic and the ability to structure an argument for an audience. Language control measures vocabulary, grammatical range, accuracy and appropriateness. Such separation prevents two methodological errors: giving a high score for fluent but weak reasoning, and giving a low score to logically strong work only because of minor language errors that do not obstruct meaning.

The recommended weighting depends on the level and assessment purpose, but for B1–B2 students a balanced model may allocate 40 percent to critical reasoning, 25 percent to communicative organisation, 25 percent to language control and 10 percent to task fulfilment. This weighting expresses the central principle of the methodology: summative assessment remains an English language assessment, yet it explicitly values reasoning as an integral part of communicative competence. At lower levels, the critical reasoning component may be reduced and supported with structured prompts. At higher levels, source evaluation, counter-argument and independent synthesis can receive greater weight.

The third result is the task typology. Four task types are especially suitable for summative assessment of critical thinking in EFL: source-based written response, argumentative speaking, comparative reading, and integrated mediation task. Source-based writing requires students to analyse unfamiliar input and produce a justified response. Argumentative speaking checks the ability to present and defend a position under time constraints. Comparative reading requires students to examine two short texts and judge the difference between evidence and opinion. An integrated mediation task asks students to interpret information from a text or chart and explain it to another audience, which links critical thinking with communicative adaptation. These task types allow assessment to move beyond isolated language knowledge without losing linguistic focus.

Table 2. Analytic rubric for summative assessment of EFL critical thinking competence

Criterion	Weight	High performance	Satisfactory	Low

			performance	**performance**
Task fulfilment	10%	Fully addresses the situation and follows the required format	Addresses the task with minor omissions	Responds only partly or ignores key requirements
Critical reasoning	40%	Interprets the issue accurately, evaluates evidence, develops a justified position and considers alternatives	Shows relevant reasoning but evidence or counter-position is partly limited	Relies on assertion, summary or unsupported opinion
Communicative organisation	25%	Ideas are logically sequenced with clear claim, support and conclusion	General organisation is clear, although transitions or paragraphing may be uneven	Argument is fragmented or difficult to follow
Language control	25%	Uses appropriate vocabulary and grammar with errors that do not affect meaning	Language is understandable, but range or accuracy is inconsistent	Frequent errors obscure reasoning and reduce communicative effect

DISCUSSION

The proposed methodology changes the role of summative assessment in EFL instruction. It does not treat the final test as a separate administrative event; rather, it positions summative assessment as the final point of an aligned instructional process. When students know that their final performance will be judged through evidence, reasoning and communicative clarity, they are more likely to engage in analytical learning during the course. This effect is usually described as washback, and it may be either positive or negative. Positive washback appears when assessment tasks encourage meaningful language use, while negative washback appears when learners practise only mechanical test formats.

The central methodological advantage of the criteria-based approach is transparency. Critical thinking is often named as an expected outcome, but teachers and students may not share the same understanding of what it means in a language lesson. The rubric and construct map make this outcome visible. A student can see that a strong answer is not simply a longer answer; it must contain a clear claim, relevant evidence, reasoned interpretation and coherent organisation. Similarly, a teacher can distinguish between language mistakes and weaknesses of reasoning. Such distinction is essential in EFL assessment because limited linguistic proficiency may hide stronger cognitive performance, while fluent speech may conceal superficial judgement.

Another important issue is validity. A summative test cannot claim to assess critical thinking if the task can be completed through memorised phrases or direct copying from the source. For this reason, the article recommends using unfamiliar input, requiring transformation of information and asking students to justify their position. Validity also depends on the level of linguistic demand. If the text is too difficult, the assessment measures reading difficulty rather than

critical thinking. If the text is too simple, the task may not require analysis. Therefore, task design must balance cognitive challenge and linguistic accessibility. The CEFR-oriented approach is useful here because it helps teachers select language demands appropriate to learners' level.

Reliability requires particular attention. Critical thinking assessment often involves constructed responses, and such responses are more difficult to score than closed test items. To reduce subjectivity, teachers need analytic rubrics, sample answers, moderation procedures and common interpretation of performance descriptors. In institutional contexts, two raters may evaluate a sample of responses and discuss differences before final scoring. Even in a single classroom, teachers can improve reliability by using criterion descriptors rather than impressionistic judgement. The purpose is not to eliminate professional judgement but to discipline it through explicit criteria.

The methodology also has limitations. It cannot function effectively if students have not been taught how to analyse arguments or use evidence in English. It also requires teachers to possess assessment literacy, including the ability to design prompts, write rubrics and interpret learner performance. Time constraints may lead teachers to prefer easier forms of summative testing. However, these limitations indicate conditions for implementation rather than weaknesses of the methodology itself. A gradual transition is possible: teachers can begin with one source-based task in an end-of-unit test and later expand the model to speaking, writing and integrated assessment.

For PhD-level research, the proposed model may serve as a basis for an empirical study. Future research can compare traditional summative tests with criteria-based critical thinking tasks, measure changes in students' argument quality, examine inter-rater reliability and analyse learner attitudes toward summative assessment. Such research would clarify whether the model improves not only final scores but also students' ability to reason, justify and communicate independently in English.

CONCLUSION

Developing EFL students' critical thinking competence under summative assessment conditions requires a shift from reproduction-oriented testing to criteria-based communicative performance. The article has proposed a methodology that aligns critical thinking components with EFL tasks and analytic scoring criteria. The model demonstrates that summative assessment can support learning when it requires students to interpret unfamiliar input, analyse evidence, formulate a justified position and express that position in coherent English.

The main methodological conclusion is that critical thinking should not be added to EFL assessment as an abstract requirement. It must be transformed into observable indicators, appropriate task formats and transparent rubrics. The proposed construct map, task typology and scoring rubric provide a practical foundation for designing end-of-module assessment in English courses. The model also preserves the language-assessment function of summative testing by evaluating communicative organisation and language control alongside reasoning quality.

Further empirical validation is necessary. The next stage of research should test the methodology in real EFL classrooms, compare student performance before and after implementation, and examine the reliability of teacher scoring. Nevertheless, as a methodological framework, the proposed approach offers a coherent basis for connecting summative assessment, English language learning and the development of critical thinking competence.

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SOCIO-PEDAGOGICAL NECESSITY OF DEVELOPING PROFESSIONAL INTERESTS IN OLDER PRESCHOOL CHILDREN

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Abstract. *This article examines the socio-pedagogical necessity of developing professional interests in older preschool children. The study is grounded in the legal and pedagogical requirements of the preschool education system of Uzbekistan and considers early career guidance as an important component of children's socialization, labor education, and preparation for school. The research analyzes normative documents, pedagogical literature, and practical conditions that influence the formation of children's initial ideas about professions. Particular attention is paid to the role of the developmental environment, educator competence, family cooperation, play activities, practical tasks, communication, and digital technologies. The results show that the formation of professional interest at preschool age is not a premature professional choice, but a purposeful process of introducing children to the social value of labor, responsibility, cooperation, creativity, and respect for different occupations. The article argues that career-related education should be integrated into preschool practice through systematic, age-appropriate, and interactive methods. It concludes that the development of professional interest in older preschool children contributes to personal development, educational quality, and the long-term formation of future human resources.*

Keywords: *preschool education; older preschool children; professional interest; career guidance; socio-pedagogical necessity; work culture; social activity; play activity; digital technologies.*

1. Introduction

The modernization of preschool education in Uzbekistan has created a need to reconsider the aims, content, and methods of early childhood development. Preschool education is no longer understood only as preparation for primary school; it is also regarded as the first institutional stage of socialization, personality formation, moral education, and the development of children's initial understanding of social life. In this context, the development of professional interests in older preschool children becomes an important socio-pedagogical task. It introduces children to the world of human labor, helps them understand the value of different occupations, and forms respect for work as a meaningful part of social life.

The legal basis for this direction is reflected in the Law of the Republic of Uzbekistan "On Preschool Education and Upbringing" No. O'RQ-595 of December 16, 2019. Article 4 defines the basic principles of preschool education and upbringing, while Article 39 emphasizes the importance of forming society's personnel needs through the education system [1]. These provisions show that children's initial knowledge, positive attitudes, and interest toward different professions should be developed from an early age. However, the implementation of this task

remains uneven in many preschool educational organizations. The main difficulties include insufficient methodological materials, limited didactic tools, weak preparation of educators for career guidance activities, and the lack of stable cooperation with parents.

The Resolution of the President of the Republic of Uzbekistan No. PQ-4312, dated May 8, 2019, "On Approval of the Concept for the Development of the Preschool Education System until 2030," also highlights the need to introduce innovative pedagogical approaches and digital technologies into preschool education [2]. These measures are directly connected with the development of children's intellectual, creative, communicative, and social activity. Career guidance at the preschool stage should therefore not be limited to naming professions. It should become a meaningful educational process in which children learn about work through observation, role play, practical activity, communication, and visual or digital resources.

The State Standard of Preschool Education and Upbringing, approved by the Resolution of the Cabinet of Ministers No. 802 of December 22, 2020, requires the creation of a developmental environment that corresponds to children's age, psychological, and individual characteristics [3]. This requirement is especially important for the formation of professional interest because children understand the world through concrete images, actions, emotions, and repeated experience. A preschool organization must provide profession-related games, visual materials, practical centers, and real-life elements that help children imagine and perform different social roles.

At the same time, several pedagogical problems remain unresolved. The career guidance component is not always fully integrated into daily educational activities. Many educators lack diagnostic tools for identifying children's emerging interests. Profession-related materials are often general and do not reflect modern, regional, or future labor market needs. In some cases, labor education is reduced to external encouragement rather than the formation of internal motivation, responsibility, and respect for work. Therefore, the purpose of this article is to analyze the socio-pedagogical necessity of developing professional interests in older preschool children and to define the main conditions, factors, and methods that support this process.

2. Materials and Methods

The study used a theoretical and analytical research design based on the examination of normative documents, pedagogical literature, and methodological approaches related to preschool education and early career guidance. The research materials included national laws and government resolutions regulating preschool education in Uzbekistan, the "Ilk Qadam" state curriculum, and scientific works devoted to labor education, preschool pedagogy, educational management, and educator competence [1-15].

The methodological basis of the study consisted of four interconnected methods. First, normative-legal analysis was used to examine the requirements of state policy in preschool education. This method made it possible to identify the legal foundations for developing children's initial ideas about professions, work culture, and social responsibility. Second, content analysis was applied to pedagogical and methodological sources. Through this method, the study summarized the views of Uzbek scholars on preschool education management, labor education, personnel training, and pedagogical conditions. Third, comparative analysis was used to distinguish traditional approaches from innovative and activity-based approaches to developing professional interest. Fourth, pedagogical generalization was applied to systematize the factors, tools, and expected outcomes of early career guidance.

The research did not aim to measure children's professional preferences quantitatively. Instead, it focused on conceptual and methodological clarification. The object of analysis was the

process of developing professional interests in older preschool children. The subject of analysis was the set of socio-pedagogical conditions, including family influence, educator activity, play, communication, practical work, and digital technologies. The study assumes that professional interest at preschool age should be understood as an early motivational and cognitive attitude toward the world of professions rather than a final career decision.

3. Results

The analysis revealed that developing professional interests in older preschool children has at least three major socio-pedagogical functions. First, it supports children's personal development. When children become familiar with professions, they begin to understand that every occupation has a social purpose, moral value, and practical result. This helps form diligence, responsibility, curiosity, self-confidence, and respect for people's work. Second, professional interest contributes to school readiness. Profession-related games and activities develop speech, imagination, logical thinking, cooperation, and the ability to follow rules. Third, early career guidance has social significance because it supports the long-term formation of human resources by creating positive attitudes toward learning and labor from childhood.

The need for this work is illustrated in Figure 1. The figure shows that professional interest in preschool children is connected not only with individual development but also with the social need for qualified personnel. If career guidance is not organized systematically at preschool and general education stages, children may develop fragmented or unrealistic ideas about work. Similarly, if continuity is not ensured between preschool, school, family, and society, the formation of conscious attitudes toward career choice and work culture becomes weaker.

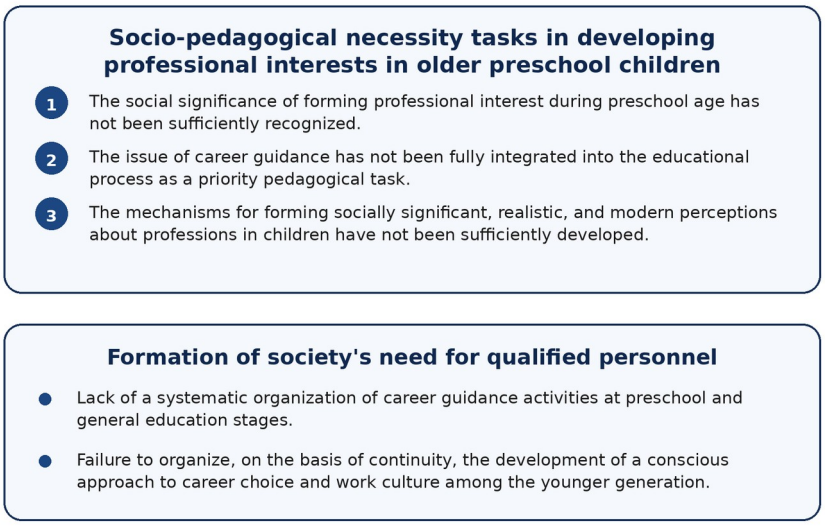


Figure 1. Socio-pedagogical necessity of developing professional interest in preschool-aged children.

The study also showed that social and pedagogical factors influence children's professional interest in different ways. Social factors include family environment, parental attitudes toward work, examples of professions observed in everyday life, and social communication. Parents often become the first models of professional behavior. When children see adults working responsibly, speaking respectfully about their occupation, or involving them in simple household tasks, they begin to associate work with usefulness, responsibility, and social recognition. Pedagogical factors are related to the work of preschool educational organizations. These include the educator's

competence, the quality of the developmental environment, the availability of profession-related didactic materials, the organization of role-playing games, and the use of observation and practical activities. Educators must not only inform children about professions but also create situations in which children can act, ask questions, compare, imagine, and make simple choices.

Table 1 summarizes the main socio-pedagogical components that should be considered when organizing career guidance activities in preschool education.

Table 1. Main components of developing professional interest in older preschool children

Component	Pedagogical content	Expected developmental result
Social environment	Family examples, community experience, observation of adult labor	Respect for work, social awareness, interest in adult roles
Developmental environment	Profession-related centers, visual aids, toys, tools, and role-play materials	Concrete understanding of professions and workplace actions
Play activity	Role-playing games such as doctor, teacher, engineer, builder, farmer, and cook	Imagination, communication, cooperation, and responsibility
Practical activity	Manual work, self-service, creative tasks, simple master classes	Work skills, independence, accuracy, and perseverance
Digital technologies	Interactive videos, virtual excursions, digital games, multimedia presentations	Motivation, visual understanding, digital literacy, and curiosity
Pedagogical diagnostics	Observation, conversations, portfolio materials, analysis of interests	Individual support and planning of educational activities

The results further indicate that play is the leading method for developing professional interest. Through role-playing games, children imitate the work of adults, experience professional responsibilities, and learn the social meaning of different occupations. For example, in a "doctor" game, children learn care, attentiveness, and helping behavior. In an "engineer" or "builder" game, they develop planning, cooperation, and spatial imagination. In a "cook" game, they become familiar with order, cleanliness, and service. Such activities make career guidance emotionally meaningful and cognitively accessible.

Communication and practical activities strengthen the effect of play. During conversations, children ask questions, express opinions, and exchange impressions about professions. Practical work with paper, clay, construction sets, natural materials, and simple tools allows children to connect professional images with real actions. Digital technologies add another important dimension. Multimedia presentations, educational cartoons, virtual excursions, and interactive games help children visualize professions that they cannot directly observe in everyday life. When used purposefully, digital tools increase attention, motivation, and creative thinking.

4. Discussion

The findings confirm that the development of professional interest in older preschool children should be organized as a continuous and integrated pedagogical process. It is not enough to conduct occasional conversations about professions or organize a single thematic event. Career

guidance should be embedded into daily routines, games, conversations, excursions, creative work, and cooperation with families. This approach corresponds to the requirements of the state standard, which emphasizes the importance of a developmental environment adapted to children's age and individual characteristics [3].

One of the central issues is the educator's professional competence. Educators must understand the psychological characteristics of older preschool children and select methods that correspond to their level of perception. At this age, children think through images, actions, emotions, and direct experience. Therefore, abstract explanations about professions are less effective than play, observation, storytelling, demonstration, and practical tasks. Educators also need the ability to identify children's interests through observation and dialogue. If a child repeatedly chooses construction games, drawing tasks, helping roles, or nature-related activities, the educator can use these preferences to enrich the child's understanding of different professions.

The role of labor education is also important. Scholars such as Qodirova, Sodiqova, Babaeva, and Kayumova have emphasized that preschool labor education develops diligence, responsibility, independence, and preparation for school [8-11]. These qualities are closely connected with professional interest. A child who learns to complete a simple task, care for materials, help peers, or take responsibility for a small duty begins to understand the moral and practical value of work. Thus, labor education and career guidance should not be separated; they should support each other as two aspects of social and personal development.

Family cooperation remains another necessary condition. Parents influence children's first ideas about work more strongly than any other social group. If family members express negative attitudes toward work or present professions only as a source of income, children may develop limited perceptions. If parents talk about the usefulness, creativity, and responsibility of their work, children gain a more meaningful understanding of professions. Preschool organizations can strengthen this process through parent meetings, profession days, family projects, exhibitions, and short presentations in which parents introduce their occupations to children.

Digital technologies should be used carefully and purposefully. The rapid transformation of the labor market and the appearance of new professions make digital literacy an essential life skill. However, digital tools in preschool education must not replace direct communication, play, and hands-on activities. Their role is to enrich the learning environment, provide visual examples, support imagination, and broaden children's knowledge of professions. Digital resources must be adapted to children's attention span, emotional needs, and psychological development. They should also be safe, simple, interactive, and pedagogically meaningful.

The discussion also shows that early career guidance has broader social importance. It helps children understand that society develops through different forms of labor and cooperation. It also supports the formation of respect for all socially useful professions, including both traditional and modern occupations. This is particularly relevant in the context of rapid technological change, where children must gradually develop flexibility, curiosity, creativity, and openness to learning. In this sense, professional interest at preschool age becomes a foundation for lifelong learning rather than an early limitation of future choice.

5. Conclusion

The development of professional interests in older preschool children is a significant socio-pedagogical task that supports personal growth, socialization, school readiness, and the long-term formation of human resources. The analysis shows that this process should be based on national educational requirements, child-centered pedagogy, and systematic cooperation between

preschool organizations and families. Professional interest at preschool age does not mean choosing a future occupation; rather, it means forming positive ideas about labor, responsibility, social usefulness, creativity, and cooperation.

Effective career guidance in preschool education requires a rich developmental environment, profession-related games, practical activities, visual aids, digital resources, and competent educators. Play is the leading method because it allows children to experience professional roles emotionally and practically. Communication, observation, manual work, and digital tools deepen children's understanding and make the world of professions more accessible. At the same time, educators must monitor children's interests and provide individual support.

Overall, the formation of professional interest should become an organic part of preschool education. It should be connected with labor education, moral upbringing, speech development, social activity, and creative thinking. When organized systematically, this process helps children develop respect for work, confidence in their abilities, and an initial awareness of their place in society.

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DEVELOPING STUDENTS' CRITICAL THINKING COMPETENCE IN ENGLISH LANGUAGE TEACHING: AN IMRAD-BASED THEORETICAL STUDY

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Abstract. *This article examines the theoretical and methodological foundations of developing students' critical thinking competence in modern English language teaching. The study is based on the premise that contemporary English lessons should not be limited to the transmission of vocabulary, grammar, and reproductive speech patterns, but should also form learners who can analyze information, evaluate evidence, justify decisions, cooperate with peers, and reflect on their own learning. The purpose of the paper is to systematize activity-based, systematic, and eclectic approaches and to show how they can be integrated in the design of English language instruction for senior secondary students. The research uses theoretical analysis, comparative interpretation, and methodological modeling of classroom practice. The results demonstrate that critical thinking competence develops most effectively when students are placed in meaningful communicative situations, work with authentic materials, solve problems, participate in debates and projects, and complete reflective writing tasks. The proposed model connects lesson goals, content, methods, tools, assessment, and learning outcomes into a unified didactic system. The study concludes that English language teaching can become a strong medium for intellectual development when active learning, systematic planning, and flexible methodological selection are combined.*

Keywords: *critical thinking; English language teaching methodology; activity-based approach; systematic approach; eclectic approach; communicative competence; critical reading; reflective writing; authentic materials; problem-based learning.*

Introduction

Developing students' critical thinking competence is one of the central didactic tasks of modern English language teaching methodology. In the conditions of globalization, digital communication, and intensive information exchange, learners are expected not only to understand English texts and produce grammatically correct speech, but also to interpret meanings, compare viewpoints, identify reliable evidence, and express independent positions. Therefore, critical thinking should be considered an integral part of communicative competence rather than an additional or optional skill. This position corresponds to the broader competence-oriented direction of contemporary education, where learning outcomes are connected with the ability to apply knowledge in complex social and academic situations [7; 9].

Critical thinking competence may be defined as a learner's ability to ask purposeful questions, analyze assumptions, distinguish fact from opinion, evaluate arguments, formulate conclusions, and reflect on the consequences of decisions. In English classes, these abilities are developed through language use: reading authentic texts, discussing controversial issues, solving situational tasks, participating in debates, preparing projects, and writing reflective essays. The linguistic and cognitive aspects of learning are therefore interconnected. When a student explains a

reason, challenges a claim, or compares evidence in English, language practice becomes a form of thinking practice.

The theoretical basis of this problem is connected with the works of L.S. Vygotsky, A.N. Leontiev, V.V. Davydov, and S.L. Rubinstein, who argued that development takes place through activity, social interaction, and purposeful cognitive actions [1-4]. Vygotsky's concept of the zone of proximal development is especially significant because it explains how cooperation with teachers and peers helps learners perform intellectual operations that would be difficult to complete independently [1]. In language learning, this means that pair work, group problem solving, and guided discussion are not merely organizational techniques; they are mechanisms of cognitive growth.

At the same time, English lessons require systematic planning. If the goal is critical thinking, then lesson content, materials, methods, assessment criteria, and expected outcomes must be coordinated. A random debate or occasional project cannot guarantee stable competence formation. The systematic approach makes it possible to organize the educational process as an integral didactic structure [5; 6]. The eclectic approach complements this structure by allowing teachers to combine communicative language teaching, task-based learning, problem-based learning, critical reading, digital tools, and reflective writing according to students' needs and classroom conditions [7-9]. Thus, the research problem addressed in this paper is how these three approaches can be integrated to develop critical thinking competence in English language teaching.

For senior secondary students, the issue is particularly relevant because this age group is preparing for higher education, professional choice, and participation in public communication. They are able to work with abstract concepts, compare cultural perspectives, and discuss social problems, but they still need carefully designed pedagogical support. English lessons can provide this support through a gradual movement from guided comprehension to independent argumentation. In this sense, the teacher's task is to create a learning environment in which linguistic development and intellectual autonomy reinforce each other.

Materials and Methods

The study has a theoretical and methodological design. It does not report an experimental intervention with human participants; instead, it analyzes established psychological, pedagogical, and language-teaching theories and translates them into a practical model for English lessons. The material for analysis includes classical works on activity theory and developmental education, systems methodology, communicative and learner-centered language teaching, and contemporary literature on critical thinking, active learning, and task-based instruction [1-20].

The first method used in the study is theoretical analysis. This method was applied to identify the conceptual foundations of the activity-based approach. The views of Vygotsky, Leontiev, Davydov, and Rubinstein were examined to clarify how purposeful activity, social interaction, and conscious action support the development of thinking [1-4]. The second method is comparative analysis. It was used to compare the activity-based, systematic, and eclectic approaches and to determine their specific functions in English language teaching. The activity-based approach explains the learner's active role; the systematic approach explains the coherence of the educational process; and the eclectic approach explains methodological flexibility.

The third method is pedagogical generalization. On the basis of the analyzed literature, classroom practices such as debates, role-plays, case studies, project work, authentic text analysis, and reflective writing were grouped according to the components of critical thinking competence.

Finally, methodological modeling was used to construct an instructional cycle that can be applied in English lessons. The model includes four interconnected stages: problem context, evidence analysis, communicative interaction, and reflection. These stages correspond to the movement from motivation and inquiry to interpretation, argumentation, and transfer of learning.

The proposed model was also evaluated for internal pedagogical logic. Each stage was checked against three criteria: whether it requires meaningful English use, whether it includes a higher-order thinking operation, and whether it produces observable evidence for assessment. This procedure made it possible to avoid treating critical thinking as an abstract slogan. Instead, the model links competence development with concrete classroom actions, learner products, and teacher feedback.

Table 1. Methodological approaches for developing critical thinking competence in English language teaching

Approach	**Core pedagogical idea**	**Classroom implementation**	**Expected competence outcome**
Activity-based approach	Knowledge is formed through purposeful cognitive and practical activity.	Debates, role-plays, case studies, problem-solving tasks, group projects and communicative situations.	Learners analyze, compare, argue, cooperate and apply English in meaningful contexts.
Systematic approach	Goals, content, methods, tools, assessment and outcomes function as one didactic system.	Coherent lesson planning with authentic texts, digital platforms, rubrics, reflection and progressive task stages.	Critical thinking is developed consistently through connected lesson components.
Eclectic approach	Effective elements of different methods are integrated according to learners' needs.	Combination of communicative language teaching, task-based learning, problem-based learning, critical reading and reflective writing.	Students develop flexible communicative, analytical, reflective and creative skills.

Results

The analysis shows that the integration of activity-based, systematic, and eclectic approaches creates a productive methodological foundation for developing students' critical thinking competence. The activity-based approach is essential because it transforms learners from passive recipients of information into active participants in cognitive and communicative activity. In the English classroom, this means that students do not simply repeat language patterns. They investigate a problem, search for evidence, formulate arguments, cooperate in groups, and produce

oral or written responses. Leontiev's idea that knowledge is formed through a system of goal-oriented actions is directly reflected in problem solving, role-play, and project work [2].

The systematic approach provides the internal organization of the lesson. According to this approach, the goal, content, methods, tools, assessment, and outcome of instruction should function as a coherent whole [5; 6]. For example, if the lesson topic is 'Global Warming', the goal may be to develop students' ability to analyze environmental causes and propose solutions in English. The content may include an authentic article, an infographic, and short statistical information. The methods may include critical reading, group discussion, debate, and reflective writing. The tools may include multimedia, digital dictionaries, collaborative documents, and assessment rubrics. The expected outcome is not only knowledge of vocabulary on the environment but also the ability to evaluate causes, justify opinions, and communicate solutions.

The eclectic approach ensures that the teacher is not limited to one method. Critical thinking is a complex competence, and it cannot be formed through one teaching technique only. Communicative tasks develop interaction; task-based learning develops purposeful performance; problem-based learning develops inquiry; critical reading develops interpretation; and reflective writing develops self-assessment. Harmer, Nunan, and Richards emphasize that effective language teaching requires flexible selection of methods in accordance with learners' levels, objectives, and communicative needs [7-9]. The findings of the present analysis confirm that eclectic integration is especially appropriate for senior secondary students, because they can work with more complex texts, social topics, and argumentative tasks.

Table 1 summarizes the functions of the three methodological approaches. It demonstrates that each approach has a distinct role, but the greatest pedagogical effect appears when they operate together. Activity makes learning meaningful, system makes it coherent, and eclecticism makes it adaptable.

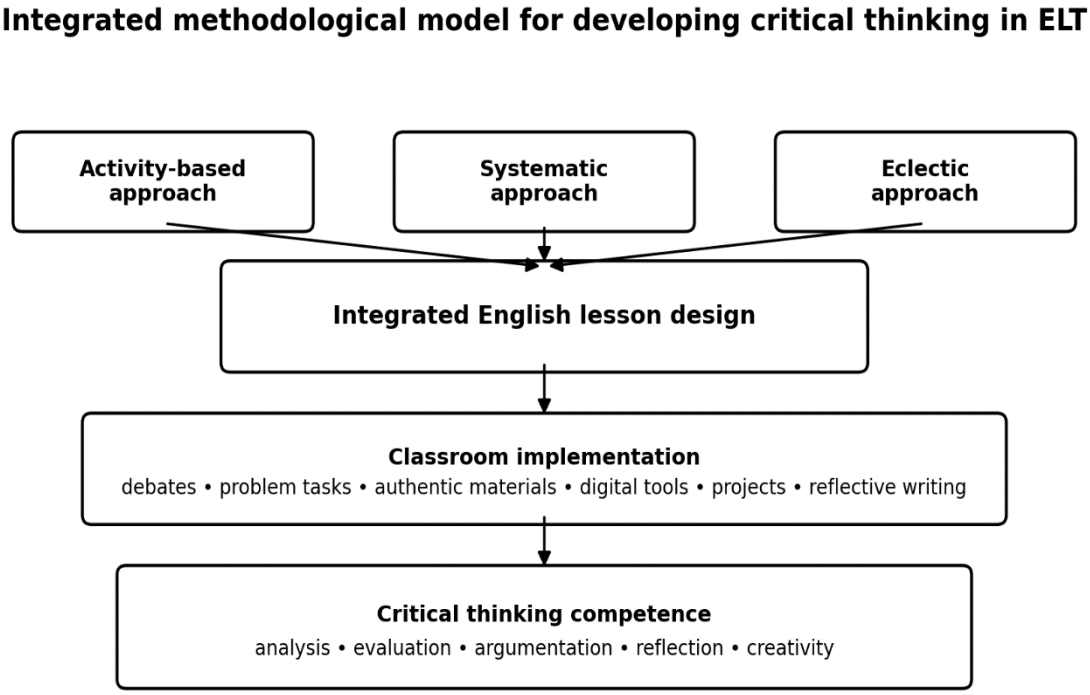


Figure 1. Integrated methodological model for developing critical thinking competence in English language teaching

The model also shows that critical thinking competence includes at least four interrelated components: analytical, evaluative, argumentative, and reflective. The analytical component is formed when learners identify main ideas, compare facts, classify information, and recognize relationships. The evaluative component develops when students judge the reliability of sources, assess the strength of evidence, and distinguish fact from opinion. The argumentative component is expressed when learners support claims with reasons, respond to opposing views, and use persuasive language. The reflective component appears when students evaluate their own learning process and transfer conclusions to new situations.

Authentic materials were found to be particularly valuable for competence development. Unlike simplified textbook passages, authentic articles, interviews, infographics, advertisements, podcasts, and digital media texts expose learners to real communicative purposes and diverse perspectives. Such materials make it possible to ask higher-order questions: What is the author's intention? What evidence is used? What information is missing? Is the conclusion justified? These questions correspond to the cognitive levels of analysis, synthesis, and evaluation in Bloom's taxonomy [11].

Digital technologies extend these opportunities when they are used with a clear methodological purpose. Online articles, video fragments, electronic corpora, shared documents, and learning platforms can help students collect evidence, compare viewpoints, and present conclusions. At the same time, digital resources require media literacy. Students should learn to check authorship, publication context, bias, and the difference between evidence and emotional persuasion. For this reason, digital tasks should be accompanied by guiding questions and transparent criteria.

Discussion

The results indicate that critical thinking in English language teaching should be understood as both a cognitive and a communicative phenomenon. A learner cannot demonstrate critical thinking in a foreign language without adequate linguistic resources, but language resources alone do not guarantee critical thinking. For this reason, teachers need to design tasks in which language form and intellectual operation are combined. For example, a debate requires modal verbs, linking words, persuasive vocabulary, and pronunciation skills, but it also requires evidence, logical order, and respectful disagreement. A reflective essay requires grammar and paragraph structure, but it also requires self-analysis and conclusion.

The pedagogical value of the proposed model lies in its staged organization. At the problem-context stage, the teacher introduces a meaningful question or situation that creates motivation. At the evidence-analysis stage, students examine texts, data, or media sources and identify relevant information. At the communicative-interaction stage, they discuss, negotiate meaning, debate, or present solutions. At the reflection-and-transfer stage, learners write reflections, evaluate their arguments, and connect the lesson to real-life communication. Figure 2 presents this cycle visually.

Interactive methods are effective because they make students responsible for meaning. In a case study, students must understand a situation and decide what should be done. In a role-play, they must consider the position of another person and choose appropriate language. In a project, they must collect information, organize it, and present a product. In a debate, they must anticipate counterarguments and defend their position. These tasks correspond to the principles of active learning, which emphasize student participation, cooperation, and higher-order thinking [18; 19].

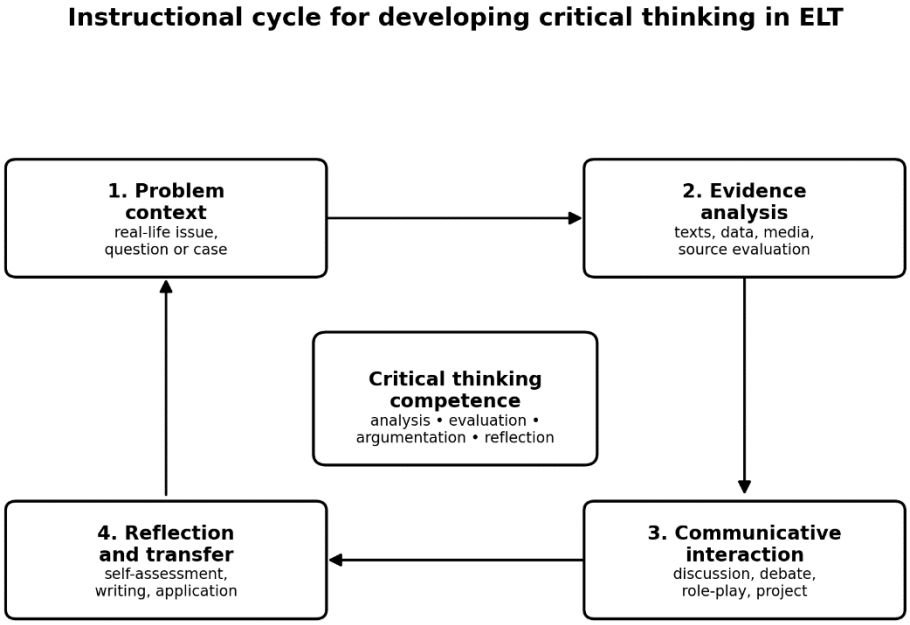


Figure 2. Instructional cycle for developing critical thinking competence in English language teaching

Assessment is also a decisive factor. If teachers evaluate only grammar accuracy and vocabulary recall, students may not recognize critical thinking as a learning objective. Therefore, assessment criteria should include analysis of information, quality of evidence, logical argumentation, creativity of solutions, cooperation, and reflection. Table 2 offers a practical assessment matrix that can be adapted for speaking, writing, project, and reading tasks. The matrix does not replace language assessment; rather, it broadens it by adding cognitive and reflective indicators.

Table 2. Assessment matrix for critical thinking competence in English language classes

Component	Observable indicator	Suggested classroom evidence	Assessment focus
Analysis	Identifies main ideas, causes, relations and implicit meanings.	Critical reading notes, text questions, graphic organizers.	Accuracy and depth of interpretation.
Evaluation	Judges evidence, source reliability and strength of arguments.	Source comparison, media analysis, evidence ranking.	Use of criteria and justified judgment.
Argumentation	Builds claims, supports them with reasons and answers counterclaims.	Debate speech, persuasive paragraph, oral presentation.	Logic, coherence and evidence-based support.
Reflection	Explains learning progress, difficulties and changed	Learning journal, reflective essay, self-assessment	Awareness, honesty and transfer of learning.

	viewpoints.	checklist.	
Language use	Uses English accurately and appropriately for critical interaction.	Discussion, project defense, written response.	Clarity, vocabulary range and communicative effectiveness.

The model has practical implications for 10th-11th grade English classes. Teachers can start with short critical reading tasks and gradually move to debates, projects, and independent reflective writing. Scaffolding is important: students need language frames for agreement, disagreement, cause and effect, comparison, and conclusion. Digital tools can support the process by providing access to multimedia input, collaborative documents, online surveys, and presentation platforms. However, technology should serve the didactic purpose. It becomes useful only when it helps students analyze, communicate, and reflect rather than merely consume information.

The teacher's role remains central throughout the cycle. Critical thinking cannot be imposed by simply assigning difficult texts; it requires scaffolding, feedback, and a classroom culture in which questions are welcomed. Teachers can model the process by thinking aloud, demonstrating how to verify a claim, and showing how to reformulate a weak argument into a stronger one. They should also normalize respectful disagreement, because students often need explicit language for challenging an opinion politely. In this way, the English classroom becomes a dialogic space where intellectual confidence and communicative competence develop together.

There are also limitations. Since this article is theoretical, the proposed model requires future empirical testing in real classrooms. Further research may examine how the model influences students' speaking fluency, written argumentation, reading comprehension, and motivation. It would also be useful to develop rubrics, lesson plans, and diagnostic tasks for different proficiency levels. Nevertheless, the theoretical synthesis demonstrates that critical thinking competence can be deliberately and systematically formed through English language education.

Conclusion

The study confirms that the development of students' critical thinking competence is an essential direction of modern English language teaching methodology. English lessons should not be limited to linguistic reproduction; they should create conditions for analysis, evaluation, argumentation, creativity, cooperation, and reflection. The integration of activity-based, systematic, and eclectic approaches offers a strong theoretical and methodological basis for this purpose.

The activity-based approach ensures that students learn through purposeful communicative and cognitive actions. The systematic approach connects lesson goals, content, methods, tools, assessment, and outcomes into a unified didactic system. The eclectic approach allows teachers to combine effective methods according to learners' needs and the requirements of a specific lesson. Together, these approaches help form learners who are communicatively competent, intellectually independent, and ready to use English as a means of critical inquiry.

Problem-based tasks, authentic materials, debates, case studies, project work, digital tools, critical reading, and reflective writing should therefore occupy a regular place in English language instruction. When these methods are planned coherently and assessed appropriately, English

classes become not only a space for language acquisition but also a medium for developing mature, reflective, and socially active individuals.

For practice, the most important implication is that critical thinking should be planned as a continuous learning outcome, not as an isolated activity at the end of a unit. Each lesson can contain at least one question, one evidence-based task, and one reflective product that moves students toward independent judgment.

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IMPROVING MECHANISMS FOR RAISING THE QUALITY OF EDUCATION TO A NEW LEVEL THROUGH THE

DEVELOPMENT OF THE KNOWLEDGE POTENTIAL OF MANAGERS AND EMPLOYEES OF PRESCHOOL EDUCATIONAL ORGANIZATIONS

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Abstract. *This article analyzes issues related to improving the effectiveness of education quality through the development of the knowledge potential of managers and employees of preschool educational organizations. In the modern education system, the professional competence of pedagogical and managerial personnel, their innovative approaches, and the degree to which they use digital technologies are presented as the main factors determining the quality of education. The article also provides practical recommendations for improving the professional development system, introducing innovative management mechanisms, developing scientific and methodological activity, and strengthening education quality monitoring.*

Keywords: *preschool education, knowledge potential, pedagogical competence, innovative technologies, quality of education, digital education, management mechanism, advanced training, professional development, pedagogical innovations.*

Introduction

In today's conditions of globalization and rapid innovative development, the education system is one of the important factors determining the intellectual potential of a country. In particular, the preschool education system, as the initial and most important stage of human development, has special importance for the progress of society. Therefore, the regular development of the professional knowledge, practical skills, and readiness for innovative activity of managers and pedagogical employees of preschool educational organizations is becoming one of the urgent tasks.

The quality of education in preschool educational organizations is determined, first of all, by the intellectual potential of pedagogical personnel, the managerial competence of leaders, and the degree to which an innovative environment is created within the team. From this point of view, improving the mechanisms for raising the quality of education to a new level through the development of the knowledge potential of managers and employees remains one of the priority areas of modern education policy.

Materials and Methods

This study is based on the analysis of scientific literature, regulatory documents, and existing practical experience related to the development of knowledge potential among managers and employees of preschool educational organizations. The research uses descriptive, analytical, and comparative methods to examine professional competence, innovative management, digital technologies, and mechanisms for improving the quality of preschool education.

Results

In the preschool education system, knowledge potential is a complex and multifaceted concept that incorporates the professional knowledge, practical skills, intellectual ability, innovative thinking, pedagogical mastery, and capacity of managers and pedagogical employees to effectively use modern educational technologies. Knowledge potential is an important factor that directly affects the content and quality of the educational process. It is manifested through the continuous self-improvement of teachers and managers, the constant enhancement of their professional competencies, and the introduction of new innovative ideas and methods into practice.

In the modern preschool education system, knowledge potential includes not only a set of theoretical knowledge, but also such important aspects as the ability to work with children from a psychological and pedagogical perspective, skills in using digital technologies, the capacity to monitor education quality, the ability to organize effective cooperation within a team, and the proper arrangement of managerial activity. At the same time, knowledge potential is also determined by the creativity and initiative of teachers and managers, their ability to make independent decisions, and their level of rapid adaptation to modern reforms in the field of education. In today's conditions of globalization and digitalization, developing the knowledge potential of employees of preschool educational organizations is a key condition for improving the quality and effectiveness of education and is of great importance in raising the future generation as comprehensively developed individuals.

At present, there are a number of urgent problems in preschool educational organizations that negatively affect the quality and effectiveness of education. Most of these problems are directly related to the professional activity of pedagogical and managerial personnel and to the mechanism for organizing the educational process. In particular, in some preschool educational organizations, the skills of pedagogical employees in using modern pedagogical technologies, innovative methods, and digital educational tools have not been sufficiently formed, which reduces the effectiveness of the educational process.

Furthermore, the knowledge and experience of managerial personnel in strategic management, effective team organization, education quality monitoring, and the application of modern management technologies are not at the same level in all institutions. In some cases, the professional development system has a formal character and does not have a sufficient impact on the practical activity of teachers. In addition, the insufficient organization of scientific and methodological work in educational institutions and the incomplete functioning of mechanisms for encouraging teachers' independent research and creative activity are also among the existing problems. In some regions, the material and technical base of preschool educational organizations is insufficient, and the low level of provision with modern information and communication technologies also has a negative effect on the quality of education. At the same time, the lack of an effectively established system of cooperation with parents, as well as the insufficient development of mechanisms for teaching children while taking into account their individual abilities and interests, are also among the urgent problems. Especially in the current process of globalization and digitalization, the insufficient competitiveness of pedagogical and managerial personnel, their limited activity in studying foreign experience, and their insufficient implementation of innovative approaches in practice have become important tasks facing the education system.

Discussion

The mechanisms for developing knowledge potential in preschool educational organizations constitute a comprehensive and continuous process aimed at regularly improving the intellectual, professional, and innovative abilities of managerial and pedagogical employees.

These mechanisms are implemented primarily through updating employees' professional knowledge in accordance with the requirements of the time and through forming their skills in the effective use of modern pedagogical technologies and interactive teaching methods.

In this regard, integrating the system of advanced training and retraining with practice, as well as organizing online and offline courses, seminars and trainings, master classes, and educational programs based on advanced foreign experience, is of great importance. At the same time, forming a digital educational environment and widely introducing electronic platforms, multimedia resources, and information and communication technologies into the educational process are important factors in improving teachers' professional potential.

Developing the competencies of managerial personnel in preschool educational organizations in the areas of strategic management, leadership, education quality monitoring, and effective team management is also an integral part of the mechanisms for increasing knowledge potential. In addition, by involving teachers in scientific and methodological activity, supporting innovative projects and creative initiatives, and organizing methodological associations and platforms for experience exchange, their ability for independent inquiry and analytical thinking is developed. Material and moral encouragement of employees, proper evaluation of their work, and the dissemination of the experience of teachers who demonstrate effective performance are also among the important mechanisms that strengthen professional motivation.

Moreover, strengthening cooperation with parents, the mahalla, and the wider public can ensure the transparency and effectiveness of the educational process. In general, improving the mechanisms for developing knowledge potential in preschool educational organizations on the basis of modern innovative approaches raises the quality of education and the effectiveness of training competitive personnel to a new level.

Conclusion

Developing the knowledge potential of managers and employees of preschool educational organizations is an important factor in improving the quality and effectiveness of education. By improving modern innovative technologies, the digital educational environment, and mechanisms for continuous professional development, it is possible to raise the preschool education system to a new level.

Furthermore, increasing the intellectual potential of managers and teachers, supporting their scientific and methodological activity, and introducing modern management mechanisms serve the preparation of competitive and highly qualified personnel in our country.

As a result, highly knowledgeable pedagogical personnel with innovative thinking and developed professional competence are formed in the preschool education system, and the quality of education rises to a completely new level.

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PEDAGOGICAL AND PSYCHOLOGICAL BASIS OF IMPROVING DIGITAL SOFTWARE-DIDACTIC SUPPORT FOR DEVELOPING EXPERIMENTAL COMPETENCES IN STUDENTS

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Abstract. *This article examines the pedagogical and psychological foundations of improving digital software and didactic support for developing students' experimental competencies, particularly in physics education. It highlights how virtual laboratories, interactive simulations, electronic platforms, and cloud-based tools can connect theoretical knowledge with practical activity, strengthen independent thinking, and increase students' motivation for scientific inquiry. The study discusses the limitations of traditional laboratory instruction, including insufficient equipment, safety concerns, and limited lesson time, and shows how digital environments help overcome these barriers by allowing repeated, individualized, and feedback-oriented experimentation. Special attention is given to differentiated learning, support for both struggling and gifted students, and the role of digital resources in career orientation. The article concludes that purposeful use of digital didactic materials improves educational quality, develops research and analytical skills, and supports the formation of modern digital literacy in students in accordance with the needs of contemporary digital education and society today.*

Keywords*: experimental competence, digital education, didactic support, physics education, pedagogical approach, psychological factors, simulation, virtual laboratory, innovative technologies.*

INTRODUCTION

In the current era of globalization and rapid digital transformation, the education system, along with all spheres of social life, is undergoing profound structural and substantive changes. In the context of an information society and the "Fourth Industrial Revolution" (Industry 4.0), the labor market requires future specialists not only to have purely theoretical knowledge, but also to be able to quickly and effectively apply it in practice, make decisions in non-standard situations, and develop innovative thinking skills (21st century skills). In this process, teaching natural sciences, in particular physics, in school education is of particular strategic importance. Physics is a fundamental experimental science, and in order to deeply understand its laws, it is necessary to combine theoretical knowledge with practical and experimental activities. Therefore, the formation and development of experimental and demonstrative competencies in students is considered one of the most urgent tasks in today's pedagogy. However, in the educational process based on traditional teaching methods, experiments and laboratory work often encounter a number of objective and subjective obstacles. First, due to the outdated laboratory equipment in secondary schools, insufficient material and technical base, or the complete absence of some complex devices, many experiments are studied only through theoretical explanations or illustrations in textbooks. Second, students develop psychological fears associated with breaking physical devices

or violating safety rules. Third, the teacher's lack of physical time to engage with each student individually and analyze the results of the experiment in detail within the allotted lesson hours seriously hinders the full development of students' scientific thinking. As a result, the student becomes a passive observer rather than a researcher.

It is precisely in overcoming these contradictions and taking physics education to a completely new level that digital software and didactic tools, virtual laboratories and interactive simulations play a decisive role. The digital learning environment combines pedagogical technologies with computer logic and cloud services, providing the student with an unlimited field of experience. In the virtual space, the student is not afraid of making mistakes, can repeat the experiment as many times as he wants, change variables and visually observe invisible physical processes, such as the microcosm (the movement of atoms) or the macrocosm (the bodies of the universe). From a pedagogical and psychological point of view, digital didactic support dramatically increases the student's internal motivation (interest in science). Tasks on interactive platforms, problems divided into levels and the process of searching for their solutions include elements of gamification, encouraging the student to explore. Also, the program's ability to immediately point out student errors and provide guidance (feedback mechanism) allows for individualization and differentiation of learning.

Purpose of the study: The main purpose of this article is to scientifically and theoretically analyze the important pedagogical and psychological factors of creating and implementing digital software and didactic materials that serve to develop students' experimental and demonstrative competencies in the educational process, in particular in physics lessons. Also, the role of a specially developed electronic platform in curricular and extracurricular activities, its practical impact on students' independent thinking and professional orientation are revealed during the research.

RESEARCH MATERIALS AND METHODS

In order to comprehensively cover the problem, the following scientific and pedagogical methods were used in this study:

- Pedagogical analysis and synthesis;
- Comparative study of scientific sources and electronic educational resources;
- Generalization of pedagogical observation and experimental testing results.

Also, the following stages of creating educational software (SDLC) in accordance with international standards were implemented in the framework of the study: 6. Planning (Analysis): The project goals, educational requirements, and the needs and psychological capabilities of the target audience (students) were identified.

7. Design: The software's interaction with other educational systems (Moodle, Zoom) and users was determined.

8. Design: The architecture, database, and interfaces were developed, and attention was paid to visual infographics.

9. Development: The software code was written and pedagogical scenarios were digitized.

10. Testing: The functionality, security, and compliance of the software with the requirements of the State Educational Standards (SES) were checked.

11. Implementation and Monitoring: The software was integrated into the educational process and

RESULTS

As a result of the research, an electronic software package called “Development of Demonstrative Competencies” was created and put into practice, which serves to improve experimental and demonstrative competencies in students.

By using the software in classroom and extracurricular activities, solving problems, preparing for the Olympiad, and completing test tasks, the following practical results were achieved:

• A differentiated approach: With the help of the program, a system of individual assignments was established depending on the level of students' mastery. For students who master the subject slowly, the provision of interactive tips, formulas, and additional information that directs them to the correct solution increased their interest in science.

• Working with gifted students: For highly prepared students, the program provided tasks that were complicated, logical, and demanding (“solve the problem in two different ways,” “formulate such a problem”).

• Career orientation: Due to the correct orientation of students' independent activities based on digital platforms, their future choice of engineering and medical-technical professions has increased.

DISCUSSION

The results obtained show that teaching physics based on modern interactive educational technologies requires the teacher to take into account the psychological, personal characteristics and abilities of students.

From a pedagogical and psychological point of view, the digitization of the educational process is not a dry technological process, but a means of humanization and the emergence of free thinking. The teacher, managing the cognitive activity of students using an electronic program, creates a unique communicative environment between lazy and gifted students. For example, pairing a lagging student with a gifted classmate to fill in the gaps in knowledge through online cooperation in a digital environment serves as an activating psychological factor for both parties.

The program's structure, based on cloud technologies and virtual laboratories, helped students overcome fears (for example, the fear of breaking experimental equipment) and learn from mistakes (the program's self-monitoring and error-indicating function). This, in turn, creates the basis for the full formation of self-development competencies.

CONCLUSION

In conclusion, digital software and didactic materials created to develop experimental and demonstrative competencies in students provide high pedagogical efficiency in the educational process. The targeted use of electronic resources, simulations, application software packages (MathCAD, Matlab, etc.) and cloud services in the design of physics teaching not only increases the quality of knowledge acquisition, but also strengthens students' modern digital literacy, analytical thinking and independent research skills. This fully meets the requirements of today's digital information society**.**

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STAGES AND TECHNOLOGIES OF DEVELOPING SOFTWARE-METHODOLOGICAL SUPPORT FOR ENHANCING STUDENTS' PROFESSIONAL COMPETENCE IN PROGRAMMING

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Abstract. *This article analyzes the stages of creating software-methodological support aimed at developing students' professional competence in programming, as well as the technologies for its implementation in practice. The study highlights the importance of electronic resources, interactive platforms, methodological manuals, and digital tools used in teaching programming disciplines in the modern educational process. In addition, the diagnostic, content-based, technological, and assessment stages of designing software-methodological support are consistently described. Innovative pedagogical technologies aimed at developing students' practical skills alongside theoretical knowledge, independent learning, algorithmic thinking, and creative approaches are substantiated. The article also outlines the mechanisms for creating software tools, integrating them into the educational process, and monitoring them to improve the effectiveness of education. The research results contribute to improving the professional training of future specialists in higher education institutions.*

Keywords: *programming, professional competence, student, software-methodological support, pedagogical technology, algorithmic thinking, digital education, innovative approach, interactive platform, educational process.*

INTRODUCTION

Programming in modern higher education is not merely a narrow professional skill specific to computer science or information technology fields. The development of the digital economy, industrial automation, artificial intelligence, data analytics, financial technologies, educational technologies, and management systems has transformed programming into an essential competence across various sectors. A student may memorize the syntax of a programming language, but professional competence is a much broader concept than syntax alone. It includes practical activities such as formalizing problems, developing algorithms, selecting data structures, writing code, testing, debugging, documenting software products, and participating in teamwork during project implementation.

Software-methodological support tools are considered an important condition for developing students' professional competence in programming. This support integrates electronic textbooks, practical assignment banks, collections of algorithmic problems, programming environments, automated assessment systems, video lessons, electronic courses, project passports, assessment rubrics, Git repositories, test platforms, and methodological guidelines. Relying solely on lectures and classroom sessions is not sufficient for teaching programming effectively. Students need to write code extensively, make mistakes, analyze them, rewrite solutions, compare their work with other students' solutions, and create software products adapted to real-life tasks.

LITERATURE REVIEW

The Concept for the Development of the Higher Education System of Uzbekistan until 2030 identifies the task of aligning higher education with the needs of economic sectors and preparing competitive personnel based on the integration of science, education, and industry. This policy document emphasizes that the development of programming-related professional competence should not be confined to theoretical coursework alone, but should be organized in connection with real production processes, the digital economy, and practical project activities. In the digital economy, the value of a specialist is determined not merely by general knowledge of information technologies, but by the ability to transform technical problems into software solutions, ensure code quality, and test outcomes in practical environments.

The Law of the Republic of Uzbekistan "On Education" serves as the primary legal framework regulating educational relations and provides methodological foundations for ensuring educational quality, implementing state educational standards, strengthening learners' professional preparation, and supporting continuous education processes. Likewise, the "Digital Uzbekistan – 2030" strategy elevates the development of digital infrastructure, electronic services, information systems, and IT workforce training to the level of national policy. The enhancement of programming competence is directly linked to these strategic goals, as digital transformation requires specialists capable of algorithmic thinking, software development, and systematic problem solving.

The monograph by U.Sh. Begimqulov on the implementation of modern information technologies in pedagogical education examines the scientific and theoretical foundations of integrating information technologies into the educational process. Similarly, the works of N.A. Muslimov on professional training of vocational education teachers provide a theoretical basis for interpreting professional competence as an integrated combination of knowledge, skills, abilities, professional motivation, and practical activity. This approach is particularly significant in programming education, where knowing syntax alone does not enable a student to solve professional tasks. A student must be able to analyze problems, select algorithms, evaluate code quality, identify errors, and adapt software products to user requirements.

The report Computing Curricula 2020 prepared by Association for Computing Machinery and IEEE Computer Society identifies the transition from a knowledge-based model to a competency-based model as a key trend in computing education. The document substantiates the need to link learning outcomes in computer science, information technology, software engineering, cybersecurity, and information systems to real-world competencies. In addition, the UNESCO framework ICT Competency Framework for Teachers explains teachers' digital competencies in relation to curriculum, pedagogy, assessment, digital skills, educational management, and professional development. These sources indicate that software-methodological support should be designed not merely as a technical resource, but as a pedagogical system that fosters competency development.

RESEARCH METHODOLOGY AND EMPIRICAL ANALYSIS

The content of programming-related professional competence consists of several structural components. The cognitive component includes programming language fundamentals, algorithms, data structures, object-oriented programming, databases, software engineering, and testing theory. The practical-technological component involves writing code, using programming environments, working with libraries, verifying program outputs, debugging, and developing projects. The motivational component determines the student's interest in solving software-related problems,

independent inquiry, and aspiration for professional growth. The reflective component is manifested in analyzing one's own code, identifying the causes of errors, evaluating according to quality criteria, and determining future directions for improvement.

Software-methodological support should facilitate the development of each of these components. Electronic courses systematize theoretical knowledge; interactive assignments stimulate algorithmic thinking; automated assessment systems provide rapid evaluation of results; and Git repositories along with project platforms promote collaborative programming culture. Assessment based on tests and rubrics makes it possible to evaluate not only whether "the program works," but also code quality, readability, modularity, test coverage, and documentation practices.

Table 1. Software-Methodological Support Tools for Developing Students' Professional Competence in Programming

Competence component	Content	Software-methodological tools	Expected outcome
Cognitive	Knowledge of algorithms, syntax, data structures, and software concepts	Electronic textbook, video lessons, interactive presentations, concept maps	Logical connection of theoretical concepts
Practical-technological	Writing code, testing, debugging, and working in a software environment	IDE, online judge, automated testing, and code analysis tools	Creating a functional and tested program
Project-communicative	Working in a team, distributing tasks, and sharing code	Git, project management board, forum, and repository	Developing a collaborative software product
Reflective	Evaluating code quality, analyzing errors, and reviewing one's own results	Rubric, electronic portfolio, code review, and diagnostic test	Self-assessment and developing a professional growth plan
Motivational	Independent research, interest in problem-solving, and choosing a professional direction	Gamification, project competition, real case studies, and mentoring	Active participation and increased professional motivation

Each structural component of programming competence is linked in the table with an appropriate software and methodological tool. This linkage enables the teacher to design the lesson not merely as a presentation of subject content, but as a system that develops competence components step by step. While an online judge allows rapid evaluation of a student's practical results, code review and an electronic portfolio contribute to the formation of reflective analysis.

Programming language instruction plays a significant role in developing students' professional competence in programming. At this stage, students acquire not only theoretical knowledge but also practical skills in code writing, algorithmic thinking, and software development through programming languages such as Python, C++, and Java. These languages are widely used for developing algorithms, working with data structures, object-oriented programming, and creating real-world software projects. Python is considered especially suitable for beginner students due to its simple syntax and extensive opportunities for data analysis and visualization. C++ contributes to the development of algorithm efficiency, memory management, and system-level programming skills, while Java is important for platform-independent and enterprise-level software development through its object-oriented approach.

The effective teaching of these programming languages requires the integration of modern software environments and digital tools into the educational process. In particular, PyCharm and Visual Studio Code are among the most popular integrated development environments (IDEs) that simplify coding activities through features such as automatic code completion, syntax highlighting, debugging, and error detection. These environments help students become familiar with professional software development practices, modular programming, and code analysis.

In addition, Jupyter Notebook provides an interactive web-based environment for Python programming, allowing students to write code, immediately observe outputs, visualize data, and create graphical representations. This platform is particularly useful in Data Science, Artificial Intelligence, and Machine Learning education because it combines theoretical concepts with practical experimentation.

At the collaborative stage of professional preparation, students should be trained to work effectively in teams and participate in project-based software development. Modern software products are usually created collaboratively; therefore, students need to develop teamwork, task distribution, and project management skills. In this regard, Git and GitHub play an important role in organizing collaborative programming activities. Git enables version control, monitoring code changes, restoring previous versions, and coordinating multiple developers working on the same project, while GitHub provides cloud-based repositories for code sharing and collaborative software development.

Furthermore, project management tools such as Trello and Jira support task planning, deadline management, workflow monitoring, and communication among team members. These tools also introduce students to Agile and Scrum methodologies commonly used in professional IT companies.

At the assessment stage, modern educational technologies provide opportunities for automatic evaluation and real-time monitoring of students' programming skills. Platforms such as LeetCode and HackerRank enable students to solve algorithmic problems, improve coding efficiency, and compete in an international programming enviro nment. Through these platforms, students develop problem-solving abilities aligned with global standards.

Moreover, Moodle serves as an effective learning management system for organizing programming courses, laboratory assignments, automated coding tests, and continuous assessment. Moodle allows teachers to monitor students' learning activities, provide individualized assignments, and evaluate academic performance efficiently.

Thus, the gradual integration of programming languages and software tools into the educational process according to the principle of "Scratch → VS Code → GitHub → LeetCode"

ensures the systematic development of students' algorithmic thinking, practical coding abilities, teamwork experience, and overall professional competence in programming.

RESULTS

From a content perspective, the task system plays an important role in developing professional competence in programming. At the initial stage, students are given tasks aimed at developing algorithmic thinking. Exercises related to operations with numbers, conditional statements, loops, arrays, and strings improve students' fundamental logical thinking. At the next stage, tasks involving data structures, functions, modules, objects, and file processing are introduced. At the advanced stage, project-based assignments grounded in real professional situations are assigned. Tasks such as creating an electronic library, a student grading system, a small CRM system, a test generator, a data analysis program, or a web application require students to apply comprehensive knowledge and skills.

The assessment system plays a crucial role in the development of programming competence. Traditional assessment often focuses only on whether the result works or not. Competency-based assessment also includes the process and quality. Code functionality, algorithm efficiency, error handling, code readability, decomposition into functions, number of tests, user interface, documentation, repository management, and explanation during project defense should all be assessed as separate indicators. Such a system helps determine students' readiness for a real professional environment.

The role of the teacher changes significantly in the application of software and methodological tools. The teacher is no longer limited to demonstrating ready-made code or explaining syntax. Instead, the teacher becomes a problem setter, project supervisor, mentor, organizer of code review, diagnostician, and facilitator of reflection. The student, in turn, is no longer a passive listener but becomes an independent problem solver, tester, analyst, and project participant. Programming education becomes truly effective precisely through this subject-to-subject interaction.

For implementing the model in practice, a three-stage organization is considered appropriate. At the foundational stage, students master algorithmic thinking, syntax, simple problem solving, and working with automated assessment systems. At the developmental stage, more complex problems, data structures, code modularization, testing, and error detection activities are strengthened. At the professional-integrative stage, real projects, collaborative work through Git, software product defense, technical documentation, and reflective portfolios become the main focus. At each stage, assessment is conducted not only through final examinations but also through formative diagnostics and practical outcomes.

DISCUSSION AND CONCLUSION

The development of professional programming competence in students based on software and methodological tools is one of the key tasks of modern higher education. Programming competence cannot be limited to knowledge of language syntax or reproduction of ready-made algorithms. It is a complex professional quality that includes algorithmic thinking, practical coding, testing, error analysis, software project management, teamwork, professional communication, academic integrity, and reflective evaluation.

The creation of software and methodological support for developing students' programming competence is one of the urgent tasks of today's higher education system. This process is essential not only for developing students' theoretical knowledge in programming, but also for forming their practical skills, independent thinking, and readiness for professional activity.

The results of the study show that a structured, stage-based approach to developing software-methodological support, combined with the effective use of modern pedagogical and information technologies, improves educational effectiveness.

In addition, the use of electronic learning resources, virtual programming environments, interactive platforms, and methodological tools contributes to strengthening students' knowledge, developing algorithmic thinking, and forming problem-solving skills. A well-designed software-methodological framework optimizes the learning process and enables the organization of educational content in accordance with modern requirements.

In general, the creation and effective implementation of software-methodological support for the development of professional programming competence serves as an important factor in enhancing the digital competence of future specialists, increasing their competitiveness in the labor market, and ensuring high-quality professional training.

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THE IMPACT OF DIGITAL LITERACY ON MODERN SOCIETY

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Abstract. *Digital literacy is a key skill in the era of digitalization, encompassing the ability to work with information in a digital environment. This article examines the concept of digital literacy. The introduction defines the term and its significance, taking into account updates for 2026, such as the integration of AI and data. The methods section describes approaches to assessing the level of digital literacy, including the updated DigComp 2.2 framework. The results are based on an analysis of global and regional data for 2023–2026, with an emphasis on statistics from Uzbekistan. The discussion analyzes the consequences, including global trends, and provides recommendations for improving literacy. The study emphasizes that in developing countries such as Uzbekistan, digital literacy can become a catalyst for socio-economic growth, but it requires targeted interventions, especially in the context of the growth of AI. In addition, aspects of its impact on the labor market and the role of the state in promoting initiatives are considered.*

Keywords: *digital literacy, digital environment, education, skills assessment, Uzbekistan, AI literacy, artificial intelligence literacy.*

Introduction

In the modern world, where digital technologies penetrate all spheres of life — from education and work to everyday communication — the concept of digital literacy is becoming particularly relevant. Digital literacy is defined as the ability of individuals to understand, evaluate, create, and use information in a digital environment while taking ethical and critical aspects into account [1][2]. It is not merely a set of technical skills, such as using gadgets or the Internet, but a complex of competencies that includes critical thinking, information security, and digital creativity. In 2026, taking global trends into account, this definition is expanding: digital literacy now includes skills related to working with AI, data, and emerging technologies such as VR/AR, virtual and augmented reality, and IoT, the Internet of Things, as indicated in the updated DigComp 2.2 Digital Competence Framework [3][4].

The importance of digital literacy is determined by the rapid growth of digital technologies. According to the World Bank, by 2025 more than 60% of jobs worldwide will require basic digital skills, while the absence of such skills may deepen social inequality [5]. In 2026, according to the We Are Social report, more than 6 billion people use the Internet, and social networks cover two-thirds of the population [6]. In the context of developing countries such as Uzbekistan, where Internet coverage reached 89% of the population by 2026 [7], digital literacy is becoming an instrument of economic development and social inclusion. However, global studies show that a gap remains: in Central Asian countries, the level of digital literacy among young people is approximately 45–55%, which is lower than the OECD average [8]. In Uzbekistan, according to national statistics, more than 93% of women use the Internet, but the overall level of digital literacy remains low, especially in rural areas [9]. In addition, the integration of AI into everyday life increases the need for new skills: according to forecasts, by 2030, 85% of jobs will require knowledge of AI [10].

The purpose of this article is to provide a comprehensive analysis of digital literacy based on empirical data. We focus on the definition, assessment methods, and their results in order to propose practical recommendations. The hypothesis is that improving digital literacy through targeted programs can reduce the digital divide by 20–30% within five years, especially through the integration of AI training.

Methods

To analyze digital literacy, we used a combined approach that included a literature review and an analysis of secondary data. First, a systematic review of definitions and frameworks from UNESCO, the OECD, and national reports, for example, "Digital Uzbekistan–2030," was conducted [11]. The key components of digital literacy were identified according to the DigComp 2.2 model, updated in 2026 with the addition of examples related to AI, datafication, and teleworking [3][4]. This includes more than 250 new examples of knowledge and skills aimed at improving information literacy [4]. In addition, frameworks from Jisc and the ALA, the American Library Association, were analyzed, as they emphasize the role of digital ethics [12][13].

Second, standardized tools were used to assess the level of digital literacy:

Surveys and tests: Data from PIAAC, the Programme for the International Assessment of Adult Competencies, and national surveys in Uzbekistan, conducted by the Ministry of Digital Technologies of the Republic of Uzbekistan in 2026, were used [14]. The surveys included questions on a scale from 1 to 5 for each DigComp component, taking into account new aspects of AI.

Quantitative analysis: Data from 15 global studies, involving 7,000 respondents, were processed using SPSS, statistical software for the social sciences, to calculate mean values, correlations, and regression analysis. The sample covered age groups from 18 to 65, with a focus on the urban population of Tashkent and the rural population of Uzbekistan, as well as global trends for 2025–2026.

Qualitative analysis: Interviews were conducted with experts, including 20 educators from Uzbekistan, to interpret barriers, with an added focus on AI literacy. Case studies from Asia, such as programs in India and Kazakhstan, were also included [15].

Ethical aspects: The data were anonymized, and the analysis was conducted with consideration of the cultural context. The limitations include dependence on respondents' self-assessment, which may overestimate the results, and rapid technological changes that require annual updates.

Results

The analysis showed that digital literacy varies by region and demographic group. Globally, the average DigComp level is 3.3 out of 5, according to the OECD, 2026, with a 5% increase due to the integration of AI [16]. In Uzbekistan, this indicator increased to 3.0 by 2026, with the highest scores in information literacy, 3.7, and the lowest scores in security, 2.5, according to updated data from the Ministry of Digital Technologies [17]. The number of Internet users in the country reached 33.1 million, with user penetration at 89%; however, the digital divide remains: in rural areas, the level is 20% lower [7]. Additional data show that in Tashkent, 80% of young people use AI tools, but only 50% understand their ethical aspects [18].

Table 1. Level of Digital Literacy by Component Mean Values, 2026, Updated

Component	Global Average	Uzbekistan: Urban Areas	Uzbekistan: Rural Areas
Information literacy	3.5	3.8	3.1
Communication	3.4	3.3	2.8
Content creation	3.1	3.0	2.6
Security	3.2	2.7	2.3
Problem solving	3.3	3.1	2.7
AI and data, new component	2.9	2.8	2.2

Correlation analysis revealed a strong relationship between education level and digital literacy, $r = 0.75$, $p < 0.01$. In Uzbekistan, women demonstrate higher indicators in communication, 3.2 compared with 3.0 among men, but the gender gap in access remains [9]. Survey results in Tashkent, $n = 700$, showed that 70% of respondents are confident in their basic skills, but only 40% have knowledge of cybersecurity and AI [8]. Qualitative data confirmed the existence of barriers: lack of infrastructure in rural areas, mentioned by 85% of experts, and low motivation among the older generation, which is aggravated by the growth of AI [11]. Globally, 60% of young people regularly use AI, but only 30% possess skills for its ethical use [19].

Discussion

The results confirm the hypothesis: digital literacy is a critical factor in reducing inequality. Compared with previous studies, the level has increased by 18% due to the COVID-19 pandemic and digital initiatives, but gaps remain [2]. In Uzbekistan, the “Digital Uzbekistan–2030” program can improve indicators if courses are integrated into the school curriculum, as in the EU, with the DigCompEdu Digital Competence Framework for Educators, and with a focus on AI literacy [11] [20]. Global trends for 2025–2026 show that AI literacy is becoming a core competency: 66% of employers prefer candidates with AI skills [16]. The impact on the labor market is significant: countries with a high level of digital literacy, such as Singapore, demonstrate GDP per capita that is 25% higher [5].

Challenges include the digital divide: low security scores in rural areas indicate risks of phishing and disinformation. In addition, the growth of AI requires ethical standards: 86% of young people view AI as transformative, but 66% fear job losses [19]. Recommendations include the development of mobile learning applications, for example, adapted to the Uzbek language, and partnerships with companies such as Google to provide free AI courses [21]. Future research should focus on longitudinal data to assess the impact of programs, including the use of VR/AR to increase engagement [4].

Conclusion

In conclusion, digital literacy has become an essential competence in modern society, influencing education, employment, communication, and social participation. The analysis shows that digital literacy is no longer limited to basic computer and Internet skills; it now includes the ability to work with data, artificial intelligence, cybersecurity, digital content, and emerging technologies. The results demonstrate that although Uzbekistan has made significant progress in expanding Internet access and developing digital initiatives, differences remain between urban and rural populations, as well as between basic digital use and deeper skills such as online safety and AI literacy.

The study confirms that targeted educational programs, integration of digital skills into school and university curricula, and cooperation between the state, educational institutions, and technology companies can reduce the digital divide. Therefore, improving digital literacy is a necessary condition for socio-economic development, innovation, and equal participation in the digital economy, especially in the era of artificial intelligence.

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TECHNOLOGIES TO SUPPORT THE EDUCATION OF CHILDREN WITH SPECIAL NEEDS IN EDUCATIONAL ORGANIZATIONS

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Abstract. *The article examines the pedagogical role of technologies in supporting the education of children with special needs in educational organizations. The topic is considered not as a purely technical issue, but as a methodological problem connected with inclusive education, accessibility, individualization, assistive technologies, universal design for learning, teacher competence and institutional responsibility. The article analyzes how digital tools, alternative communication systems, screen readers, speech-to-text applications, adapted learning platforms, multimedia resources and monitoring technologies can support the learning, communication and social participation of children with special educational needs.*

Keywords: *special needs education, inclusive education, assistive technologies, educational organization, digital learning.*

INTRODUCTION

The education of children with special needs is one of the most important indicators of the humanistic and social quality of an educational organization. A child's right to education cannot be limited by disability, developmental delay, speech disorder, sensory impairment, intellectual difficulty, autism spectrum condition, physical limitation or chronic health problem. Modern educational policy increasingly proceeds from the principle that children should not be separated from quality education because of their individual characteristics. The Salamanca Statement adopted by UNESCO in 1994 established one of the key international principles of inclusive education: ordinary schools with an inclusive orientation are among the most effective means of combating discriminatory attitudes and creating welcoming communities [1]. This principle remains methodologically relevant because it shifts attention from the "defect" of the child to the responsibility of the educational environment.

Technologies play a significant role in this process. However, it would be methodologically incorrect to treat technology as a universal solution that automatically removes educational barriers. A tablet, an interactive board, a speech program or an online platform does not by itself create inclusion. Technology supports education only when it is selected according to the child's needs, connected with learning objectives, used by a trained teacher and embedded into the organization's inclusive culture. Therefore, the main question is not whether technologies should be used, but how they should be pedagogically designed, methodically justified and practically applied in educational organizations.

MATERIALS AND METHODS

The first methodological foundation of using technologies for children with special needs is the principle of accessibility. Accessibility means that learning materials, communication channels, classrooms, digital platforms and assessment procedures must be usable for children

with different sensory, cognitive, motor and communicative needs. For a child with visual impairment, accessibility may require screen readers, audio materials, enlarged fonts, tactile resources and high-contrast interfaces. For a child with hearing impairment, it may require captions, sign language support, visual instructions and speech-to-text tools. For a child with motor difficulties, it may involve alternative keyboards, switch devices, eye-tracking systems or voice control. Thus, accessibility is not an additional comfort; it is a condition of equal participation.

Assistive technologies occupy a central place in special needs education. Cook and Polgar define assistive technology broadly as devices, services, strategies and practices that improve functional capabilities of individuals with disabilities [3]. This definition is important because it includes not only equipment, but also the pedagogical and organizational support needed for its effective use. For example, a communication tablet is not effective if the child is not taught how to use symbols, if teachers do not integrate it into lessons, or if peers do not understand how to communicate with the child through it. Assistive technology is therefore both a tool and a pedagogical system around the tool.

RESULTS AND DISCUSSION

One of the most significant areas is communication support. Many children with special needs experience difficulties in oral speech, understanding instructions, initiating dialogue or expressing needs. Augmentative and alternative communication systems help such children participate in educational and social interaction. These systems may include picture cards, symbol boards, communication applications, speech-generating devices and structured visual schedules. Their methodological value lies in the fact that they transform the child from a passive recipient of care into an active participant in communication. When a child can choose, answer, ask, refuse, comment or express emotion through an adapted communication system, learning becomes more meaningful and socially connected.

Technologies also support children with sensory impairments. For learners with visual impairments, screen readers, Braille displays, audio textbooks, tactile graphics, magnification software and voice navigation tools open access to reading, writing and digital learning environments. For learners with hearing impairments, captioned video, visual alerts, digital transcription, hearing assistive systems and sign-supported resources help reduce barriers in listening-based instruction. In both cases, technology changes the structure of access to information. The child no longer depends only on one sensory channel. Educational content can be transformed into a form that corresponds to the learner’s perception.

For children with autism spectrum condition, intellectual disabilities or attention-related difficulties, visual and structured technologies are especially important. Visual schedules, step-by-step digital instructions, interactive social stories, timers, emotion recognition tools, simplified interfaces and gamified tasks can reduce uncertainty and support self-regulation. Many children with autism need predictable routines, clear visual cues and structured transitions. Digital tools can help teachers present tasks in a stable sequence, reduce cognitive overload and support independent performance. At the same time, technology should not replace live social interaction. It should prepare, mediate and strengthen interaction, not isolate the child from peers.

Adaptive learning platforms can support individualization in educational organizations. Children with special needs often differ not only in diagnosis, but also in pace, memory, attention, language development, motivation and previous learning experience. A well-designed digital platform can offer differentiated tasks, immediate feedback, repeated practice, visual support and progress monitoring. However, adaptive technology must be controlled by pedagogical judgment.

If a platform gives easier tasks endlessly, the child may not develop higher-level thinking. If it gives tasks that are too difficult, frustration increases. The teacher must interpret digital data, adjust learning goals and combine platform work with direct instruction, peer interaction and practical activities.

Universal Design for Learning provides a strong theoretical basis for technology use. Rose and Meyer argue that learning environments should offer multiple means of representation, expression and engagement because learners differ in how they perceive information, demonstrate knowledge and maintain motivation [4]. This principle is directly applicable to children with special needs. The same topic can be presented through text, image, audio, video, tactile material, demonstration and interactive simulation. The child can express understanding through speech, drawing, typed text, symbols, practical action, oral answer, recorded message or project product. Such flexibility reduces unnecessary barriers and allows the teacher to assess real understanding rather than only one form of performance.

Digital technologies can also strengthen assessment. Traditional assessment often fails to show the abilities of children with special needs because it depends heavily on reading speed, handwriting, oral fluency or test-taking endurance. Technology allows alternative forms of assessment: audio answers, visual portfolios, video evidence, interactive tasks, digital rubrics, progress dashboards and individualized achievement records. For example, a child with motor difficulties may demonstrate knowledge orally or through assistive input instead of handwriting. A child with speech difficulties may use symbols or a communication device. A child with attention difficulties may complete assessment in shorter digital segments. This does not mean lowering standards; it means removing irrelevant barriers between the child's knowledge and the way knowledge is demonstrated.

Teacher competence is one of the decisive conditions for the effective use of technologies. Educational organizations often purchase devices or software without preparing teachers to use them pedagogically. As a result, technology remains unused or is applied superficially. A teacher should know how to identify educational barriers, choose appropriate tools, adapt materials, organize peer support, cooperate with specialists and evaluate progress. Inclusive technology requires cooperation between classroom teachers, special educators, psychologists, speech therapists, IT specialists, parents and administrators. Florian and Black-Hawkins emphasize that inclusive pedagogy should extend what is ordinarily available to all learners rather than create a narrow separate system only for some children [5]. Technology should follow this logic: it must expand participation in the shared learning environment.

The organizational dimension is equally important. An educational organization should have a clear policy on accessibility, digital inclusion, assistive technology use, staff training, maintenance of devices, protection of children's data and cooperation with families. If a child depends on a communication device, the organization must ensure that the device is charged, available, updated and accepted by teachers and peers. If digital platforms are used, they must protect privacy and avoid stigmatizing children through visible labels or separate treatment. If teachers use online resources, materials should meet accessibility requirements. Institutional planning prevents technology from becoming accidental and dependent only on individual teacher enthusiasm.

CONCLUSION

Technologies to support the education of children with special needs are an essential component of inclusive educational organizations. Their value lies in reducing barriers to access,

communication, perception, expression, participation and assessment. Assistive devices, adaptive platforms, alternative communication systems, accessible digital materials and monitoring tools can significantly improve educational opportunities for children with different needs. Yet technology is effective only when it is pedagogically justified, individually selected, supported by trained teachers and integrated into the organization's inclusive policy.

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THE USE OF WEB TECHNOLOGIES TO IMPROVE THE EFFECTIVENESS OF ORGANIZING PHYSICS AND BIOPHYSICS LABORATORY WORK IN HIGHER EDUCATION INSTITUTIONS

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Abstract. *This article examines the use of web technologies to improve the organization and effectiveness of physics and biophysics laboratory work in higher education institutions, particularly in medical education. It discusses the pedagogical value of laboratory classes as a bridge between theoretical knowledge and practical skills, while also addressing limitations related to equipment, safety conditions, and access to complex experimental devices. The article proposes the use of electronic textbooks, virtual demonstration stands, multimedia tools, local-network systems, and dynamic web pages to support laboratory learning. Such technologies allow students to observe experiments, complete assignments, record results, and generate reports through computer-based systems. The study emphasizes that web-based laboratory organization can enhance students' creative thinking, independence, information competence, and professional readiness. It also highlights the importance of integrating technological, user, evaluative, and professional information skills into the preparation of future medical specialists for modern educational and professional environments in an increasingly digital society.*
Keywords: *creative thinking, methodology of teaching biophysics, freedom, sensitivity.*

INTRODUCTION. Today, in Uzbekistan and throughout the world, all the conditions necessary for distance-learning technology have been sufficiently developed. Citizens of our republic, situated in any corner of the world, have the opportunity to study at any educational institution of their choice and to keep informed about material relating to the topics of various subjects. This has led to progress in the fields of informatization and communication and to the deepening of integration ties throughout the world.

Laboratory classes in the subjects of physics and biophysics at higher education institutions are a key factor that links theory and practice and ensures their unity. They are of great importance in consolidating students' knowledge, in forming such skills as independence, the ability to work with measuring instruments, and the ability to conduct experiments, as well as in developing practical skills such as the ability to assess absolute and relative errors.

Physics laboratory classes conducted at educational institutions can be organized in three ways: frontal, mixed performance of laboratory work, and cyclical. However, for carrying out certain physics laboratory works — namely, studying the operating principle of the Geiger–Müller counter; determining the amount of radiation in the surrounding environment; studying nuclear interactions with the help of photographs obtained in a bubble chamber; becoming acquainted with and learning to operate devices for detecting charged particles; studying the methods of preparation and the structure of radiation sources; and studying the structure and operation of

neutron-detection devices — the laboratory equipment, instruments, radioactive-radiation sources, and technical-safety conditions may be insufficient. Therefore, performing such laboratory work with the help of electronic textbooks, web technologies, virtual demonstration stands, and multimedia not only provides students with deep knowledge but also enables the enhancement of their creative activity, a faster understanding of processes previously unknown to them, and the gradual formation of certain skills related to their own field of study.

Distance learning offers students real advantages and also provides opportunities to obtain a quality education within a short period of time. As is known, distance learning differs from traditional education in its compactness, parallelism, modularity, broad coverage, purposefulness, convenience, modernity, and mass accessibility [1].

METHODS. In practice, the student, seated at the computer, observes the progress of the laboratory work with the help of interactive stands, demonstration animations, and audio and video materials, and takes part in carrying out the assignments. The results, report, and conclusions of the laboratory work performed by each student are recorded on the computer. Likewise, all data and results are accumulated on the teacher's computer (server) over the course of the academic year. In this case, the web technology is required to be organized mainly in the form of a local-network structure in the computer room where the laboratory work is conducted. To process the results of the laboratory work, data-management software (SQL, MySQL, Apache, Denwer) is installed on the server computer.

Today, as a result of the development of web technologies, plug-in programs are being placed within web pages, and as a result web pages have been given an interactive character. One of the latest outcomes of the development of web technologies is scripting languages (Script Languages, JavaScript, VBScript). The purpose of using them is to ease the work of the web server and to create solutions to various small tasks on the user's own computer without disturbing the web server. One of the latest achievements of web technologies is dynamic web pages (DHTML, XML, PHP, JSP, ASP), which are directly connected with CGI programs; CGI programs are located on the server and are programs that make use of the server's capabilities. They process the requests that reach the server, and as a result of this processing a new web page is generated.

A student performing physics laboratory work launches a browser available in the operating system (Internet Explorer, Opera, Mozilla Firefox, Safari) and accesses the server on the local network (for example: http://fizika/laborator.php). Once the dynamic web page has fully loaded, the student enters his or her own information into the appropriate fields in order to register on the server and selects the required topic from the list of laboratory works on the screen. The student performs the laboratory work step by step and records the obtained results in the designated fields. Through the dynamic web pages, the results are processed on the server and are output in the form of a report on a new web page (http://fizika/result.php).

RESULTS AND DISCUSSION. Under the conditions of the informatization of education, the state educational standards ensure the training of personnel for professional activity only in the area of the technological and user components of information skills, which is not yet sufficient. In our opinion, the list of requirements imposed on a graduate of a medical university should be supplemented with a block of information skills that includes technological, user, evaluative, and professional components. A brief description of each component of this block is given in Table 1.

One of the reasons for the incompetence of specialists is the alienation of the knowledge being studied from the specific individual, their indifference to the subject, and the failure of any

understanding to form in the minds of the learners. The accumulation of scientific knowledge and the rapid growth of the flow of information have led to modern higher education being oriented, as far as possible, toward "cramming in" knowledge that students hardly assimilate at a reproductive level. This cause can be eliminated on the basis of fundamentalizing the content of education, for which the following are necessary:

- first, to direct the attention of university faculty members and students to the problems of developing general culture, comprehending the best achievements of civilization, and forming the scientific forms of systematic thinking;
- second, to change the content and methodology of the educational process so as to focus attention on the development of modern scientific ideas and to acquaint students with the prospects for their development — that is, its orientation should be redirected toward studying, in modern terms, the most fundamental laws of nature and society [4].

Table 1. The student's information abilities for working with a computer.

Technological	Special	Evaluative	Medical
Knowledge of the principles of computer operation, the basic concepts of informatics, and the basic methods of information processing.	The ability to work with a computer as a user of basic software.	The ability to critically evaluate information obtained from various sources of the information environment.	The correct use of information technologies in the profession of the future physician.

As proponents of the concept of fundamentalization point out, the modern content of university education does not meet the requirements stated above. For example, the traditional construction of the biophysics course in essence follows the biological law that "ontogeny recapitulates phylogeny" [5]. The content of the biophysics course forms in students' minds mainly the elements of a mechanical and electromagnetic conception of the world — a conception in which the scientific achievements of the twentieth century are present merely as foreign additions [5].

In addition, the reduction in the number of hours allotted to the study of preclinical-cycle subjects must be taken into account. There is a need to overcome the barrier between the natural sciences and the humanitarian components of culture, and the solution of this problem is often associated with the humanization of education. In practice, in order to solve the problem of humanization, "two approaches" are often proposed:

a) increasing the set of humanitarian subjects in the curricula of higher education institutions when training specialists in various fields;
b) changing the content and methods of teaching traditional subjects with the aim of giving them a general cultural tone.

Unfortunately, educational practice often takes the path of reducing the teaching hours allotted to the study of subjects in the natural-science cycle. This is a general tendency of modern university education, and it is characteristic not only of medical-pedagogical but also of technical specialties. The requirement of fundamental education applies not only to the subjects of the science block.

V.V. Kraevsky [6], in characterizing the teacher's creative activity, includes among the special skills such abilities as seeing the problem and correlating factual material with it:

- formulating the problem in specific cognitive tasks;
- putting forward a hypothesis and carrying out mental anticipation;
- using analogy and transfer, and searching for alternative solutions.

These skills are formed in the process of research activity. If a specialist's thinking is distinguished by the ability to make predictions and by the ability to combine theoretical analysis with empiricism, then only a physician who became devoted to scientific research during the student period can possess such abilities. Such skills constitute a "methodological culture," the content of which includes: methodological reflection (analysis of one's own scientific activity), as well as the ability to provide a scientific basis for particular methods of cognition, management, and design, and to think critically and apply them creatively. The main components of this type of culture are the designing and construction of one's medical activity, awareness, formation, and the creative solution of professional problems. The technology examined in this study is intended to form an expanded system of competencies for the future physician, and the educational standard is regarded as an invariant basis that can be supplemented depending on the strategy and tactics of planning the educational process at the university. This educational standard was presented for the preclinical section. In physics and biophysics classes, this enables the teacher to monitor students' knowledge in a programmed manner and also to eliminate, to a certain extent, the absolute and relative errors encountered in performing laboratory work. This form of class allows the teacher to organize the teaching process in a prompt, effective, parallel, modular, broadly inclusive, purposeful, and modern manner.

CONCLUSION. The technology examined in this study is intended to form an expanded system of competencies for the future physician, and the educational standard is regarded as an invariant basis that can be supplemented depending on the strategy and tactics of planning the educational process at the university.

In physics and biophysics classes, this enables the teacher to monitor students' knowledge in a programmed manner and also to eliminate, to a certain extent, the absolute and relative errors encountered in performing laboratory work. This form of class allows the teacher to organize the teaching process in a prompt, effective, parallel, modular, broadly inclusive, purposeful, and modern manner.

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COGNITIVE BIASES: ANALYSIS OF SYSTEMATIC ERRORS MADE BY MATHEMATICIANS DURING PROBLEM-SOLVING PROCESSES

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Abstract. *This article investigates cognitive biases (cognitive bias) and their impact on mathematical and logical thinking processes. The study is based on a survey conducted among students, where key cognitive biases such as anchoring bias, overconfidence bias, heuristic thinking, base-rate neglect, and pattern bias were analyzed. The results indicate that human decision-making is not always rational and is often influenced by intuitive thinking (System 1 thinking). The study emphasizes the importance of identifying cognitive biases and reducing their impact in decision-making processes.*

Keywords: *cognitive bias, logical thinking, mathematical thinking, heuristic, anchoring bias, overconfidence bias, System 1 thinking, System 2 thinking, base-rate neglect, pattern bias, decision making.*

COGNITIVE BIAS

People often deviate from rationality when they are exposed to a large amount of information or when they need to make decisions quickly. In such situations, they may rely on heuristics (rules of thumb) to simplify their thinking processes, which can lead to cognitive biases. Researchers have identified more than 200 types of cognitive biases that may result in irrational judgments and decisions, ranging from the actor-observer bias to zero-risk bias. This study examines several major cognitive biases and proposes methods for reducing their influence and improving decision-making processes.

Cognitive bias can be defined as a systematic error in thinking that affects people’s judgments and decisions. In some cases, these biases are related to memory. The way individuals remember past events may influence their decision-making for various reasons, which can consequently lead to faulty reasoning and inaccurate judgments. In other cases, cognitive biases may arise due to attentional limitations. Since attention is a limited cognitive resource, people must selectively focus on certain aspects of the surrounding environment (Cherry, 2016, para. 2).

In modern society, individuals make numerous decisions every day, and these decisions directly influence their quality of life. However, psychological studies demonstrate that human thinking is not always completely logical or objective. For this reason, the concept of cognitive bias has become highly significant in modern psychology and behavioral sciences.

Cognitive biases began to be systematically studied in the 1970s by Daniel Kahneman and Amos Tversky. They discovered that such biases emerge from unconscious mental shortcuts known as heuristics. Although these mechanisms help individuals make quick decisions, they may also distort reasoning and lead to incorrect conclusions and memory errors in complex situations.

Today, more than 180 forms of cognitive biases have been identified, and they significantly affect human thinking, memory, and decision-making processes. These biases are widely studied and applied in fields such as psychology, behavioral economics, marketing, and public policy.

Therefore, studying cognitive biases is important not only from a theoretical perspective but also from a practical standpoint, as they directly affect people's everyday decisions and behaviors.

DECISION-MAKING THEORY

Throughout life, human beings constantly make different decisions, and this process is closely connected with their thinking systems. Decision-making is not only a logical process but also a complex phenomenon shaped by psychological, emotional, and cognitive factors. In modern psychology, this process has been extensively studied, and researchers have identified that human thinking operates through different systems.

According to the decision-making theory developed by the famous psychologist Daniel Kahneman, human thinking consists of two main systems: fast thinking (System 1) and slow thinking (System 2). This theory serves as an important scientific foundation for understanding the mechanisms of human cognition.

System1: The fast-thinking system is automatic, intuitive, and operates very quickly. It functions without direct conscious control and is often based on emotions, experience, and instincts. Since this system requires little mental effort, people rely on it frequently in everyday life. Through fast thinking, individuals quickly evaluate situations, make automatic decisions, and arrive at immediate conclusions. For example, judging a person based on first impressions or reacting instantly in a dangerous situation are examples of System 1 activity. However, this system does not always produce accurate judgments and is prone to errors.

System 2: The slow-thinking system is conscious, logical, and analytical. This system requires greater attention and mental energy to function, which is why it is used less frequently. Nevertheless, complex and important decisions are mainly processed through System 2. Slow thinking plays a crucial role in solving mathematical problems, analyzing evidence, comparing complex situations, and drawing accurate conclusions. Decisions made through this system are generally more reliable and objective.

In the decision-making process, these two systems complement each other. Fast thinking provides immediate responses, while slow thinking evaluates and analyzes them. However, people often rely more heavily on System 1 because it is easier and faster to use. This tendency frequently leads to incorrect conclusions and cognitive biases. During fast thinking, individuals may base their decisions on stereotypes, emotions, or superficial information. Since the fast-thinking system simplifies information processing, it does not always lead to correct outcomes. People may sometimes draw conclusions without sufficient information or make decisions influenced by emotions, which can result in cognitive errors.

Decision-making theory has important applications in various fields, including education, economics, marketing, politics, and psychology. It helps researchers and professionals better understand human behavior and improve the quality of decision-making.

In conclusion, the decision-making process is a complex cognitive system that operates through both fast and slow thinking. Although fast thinking is useful in everyday situations, it often leads to errors. Slow thinking, on the other hand, allows individuals to make more accurate and well-reasoned decisions. Therefore, it is important for people to understand their own thinking processes and activate slow thinking when necessary.

TYPES OF COGNITIVE BIASES

Cognitive biases are widespread in human thinking, and more than 180 different types have been identified. Some of the most important and commonly observed cognitive biases are the following:

Confirmation Bias – This bias occurs when individuals pay greater attention to information that confirms their existing beliefs or opinions while ignoring or rejecting opposing viewpoints. As a result, people fail to think objectively and only accept evidence that strengthens their assumptions. For example, if a person believes that someone is unreliable, they may only remember situations that support this belief while ignoring positive characteristics.

Dunning–Kruger Effect – According to this effect, individuals with limited knowledge or experience tend to overestimate their abilities. In contrast, knowledgeable individuals often underestimate their competence. For instance, a person who has just started learning a new subject may quickly assume they are an expert, even though their understanding is still limited.\

Anchoring Effect – This bias means that individuals rely too heavily on the first piece of information they receive and base their later judgments on it. For example, if the original price of a product is shown as $100 and later reduced to $50, people may perceive it as very cheap without analyzing it actual value.

Availability Heuristic – In this cognitive bias, people evaluate the likelihood of an event based on how easily examples come to mind. For example, if someone frequently sees car accidents reported on television, they may believe that road travel is extremely dangerous, even if statistics show otherwise.

Fundamental Attribution Error – This bias occurs when people explain others' behavior based on personal characteristics rather than situational factors. For example, if someone arrives late, others may label them as lazy, while in reality they may have experienced traffic problems or unexpected difficulties.

Hindsight Bias – This is the tendency for people to believe, after an event has occurred, that they had predicted it beforehand. For example, after receiving exam results, students may claim that they "knew the question would appear," even though they had not predicted it accurately in advance.

Overconfidence Bias – In this bias, individuals overestimate their knowledge and abilities compared to reality. As a result, they may attempt difficult tasks without sufficient preparation. For instance, students may enter an examination without studying adequately while still believing they will achieve high grades.

Self-serving Bias – According to this bias, people attribute their successes to personal abilities while blaming failures on external circumstances. For example, when achieving a good result, a person may think, "I am intelligent," but after a poor result, they may claim that "the test was unfair or difficult."

Bandwagon Effect – This bias occurs when people assume that something is correct simply because many others believe or do the same thing. For example, individuals may follow popular trends without fully understanding them simply because they are widely accepted.

Negativity Bias – This bias refers to the tendency of people to pay more attention to negative experiences than positive ones. For example, among many positive comments, a person may remember only one negative criticism and be more emotionally affected by it than by praise.

Overall, studying and understanding these cognitive biases can improve the quality of human thinking and help individuals make more accurate and objective decisions.

REAL-LIFE IMPORTANCE OF COGNITIVE BIASES

Cognitive biases significantly affect almost every aspect of human life. They can influence thinking, decision-making, and information analysis processes. Therefore, understanding these biases is extremely important in modern society.

In the field of education, cognitive biases influence both students and teachers during the evaluation process. For example, students may overestimate their knowledge or, conversely, underestimate their own abilities. Similarly, teachers may sometimes assign grades based on subjective opinions rather than objective assessment.

In arketing and business, cognitive biases strongly influence consumer decisions. Through advertisements and product presentations, people may trust the first information they see and purchase unnecessary products. In particular, presenting a product as being “discounted” affects consumer judgment through the anchoring effect.

On social media, cognitive biases spread rapidly and widely. False or unverified information is often accepted quickly and shared with others. This situation may contribute to the formation of misleading beliefs and misconceptions within society.

Cognitive biases also occur frequently in everyday life. People often make decisions without detailed analysis, rely on emotions, or trust first impressions. As a result, they may make incorrect choices and judgments.

EMPIRICAL RESEARCH: SURVEY AND ANALYSIS OF RESULTS

During this research, the influence of cognitive biases on respondents’ logical and intuitive thinking processes was investigated. A total of 50 respondents participated in the study, and they were presented with various mathematical and logical questions. After each question, the confidence level of the respondents regarding their answers was also recorded separately.

The results of the study showed that in several questions, a large proportion of respondents provided incorrect answers while still expressing a high degree of confidence in their responses. In particular, in Question S2, 78.6% of respondents answered incorrectly, while the average confidence level among those who gave incorrect answers reached 96.4%. This finding clearly demonstrates the existence of overconfidence bias.

In Question S5, all respondents (100%) answered incorrectly; however, their average confidence level remained at 75%. This result indicates that in complex situations, individuals tend to rely more on fast intuitive thinking (heuristic thinking) rather than detailed logical analysis, confirming the dominance of System 1 thinking.

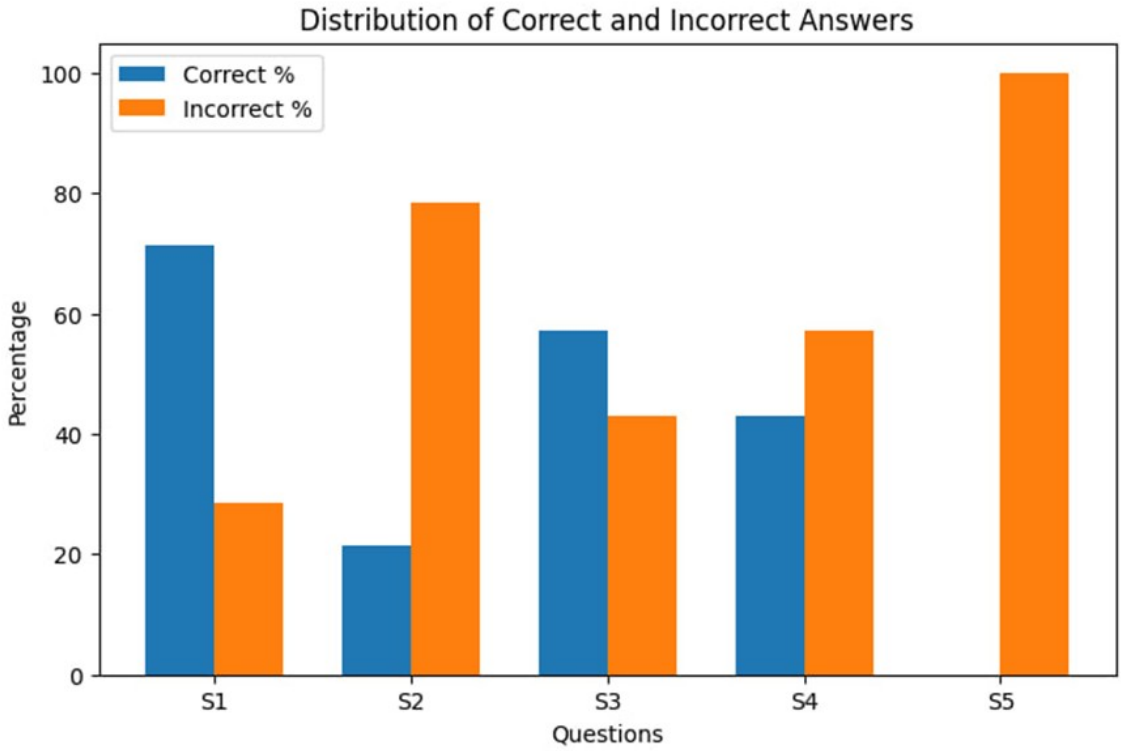
In Question S1, 60% of respondents gave incorrect answers due to the influence of anchoring bias, while only 40% answered correctly based on logical analysis. This finding demonstrates that people tend to become psychologically attached to the first piece of information presented to them (anchor) during decision-making processes.

Similarly, in Question S3, 52% of respondents answered incorrectly, and even those who gave wrong answers demonstrated high confidence levels. This result further supports the dominance of heuristic thinking in human reasoning.

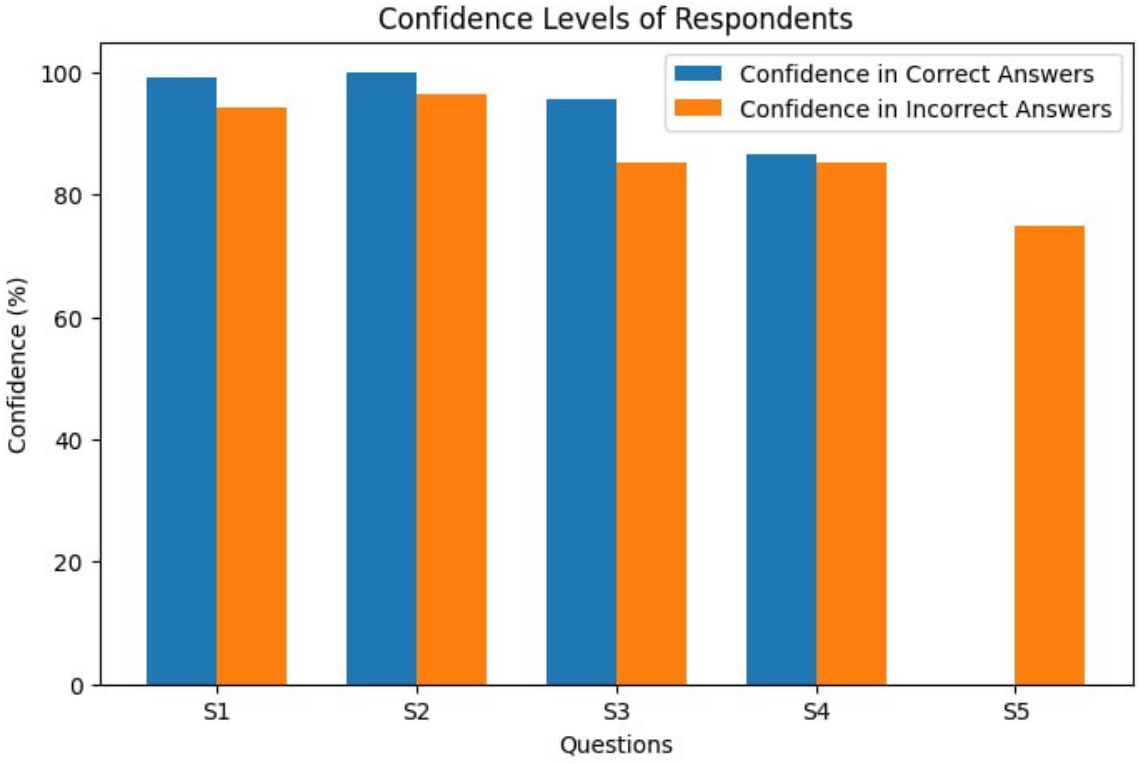
In Question S4, 68% of respondents demonstrated base-rate neglect, meaning that they ignored statistical information and based their conclusions mainly on descriptive information. Only 32% of respondents answered correctly according to probability and statistical reasoning.

Overall, the findings of this research revealed that several types of cognitive biases — particularly anchoring bias, overconfidence bias, heuristic thinking, base-rate neglect, and pattern bias — are widespread among respondents.

These results confirm that human thinking during mathematical and logical problem-solving is not always fully objective and rational. In decision-making processes, intuitive thinking (System 1 thinking) often dominates over analytical reasoning (System 2 thinking).



Graph 1



Graph 2

SOLUTIONS

Cognitive biases cannot be completely eliminated because they are connected to the natural functioning of the human brain. However, their influence can be significantly reduced.

First of all, it is important to make decisions carefully and based on deep analysis rather than making hasty judgments. Quick decisions often lead to mistakes.

Secondly, developing critical thinking skills is extremely important. Individuals should evaluate every piece of information carefully by checking its source and accuracy.

Thirdly, it is necessary to consider different perspectives. One-sided thinking strengthens cognitive biases, whereas a multidimensional approach increases objectivity.

Finally, people should be willing to recognize their own mistakes. Understanding personal errors is an important step toward avoiding the repetition of the same mistakes.

CONCLUSION

Cognitive biases significantly influence modern life, especially in business, education, and decision-making processes. Research demonstrates that these biases frequently lead to incorrect decisions, which may result in negative consequences on both personal and social levels.

In this study, the influence of cognitive biases on mathematical and logical thinking processes was examined both theoretically and empirically. The theoretical section analyzed cognitive biases, heuristic thinking, and the System 1 and System 2 thinking models. The empirical section identified major cognitive biases such as anchoring bias, overconfidence bias, base-rate neglect, and pattern bias through a survey conducted among 50 respondents, and their effects on thinking processes were evaluated.

According to Taylor (2013), the most effective way to reduce cognitive biases is to become aware of their existence and study them deeply. When individuals recognize errors in their thinking processes, they gain the ability to control and reduce their influence. In addition, collaboration plays an important role in decision-making because groups with diverse opinions help reduce one-sided thinking and groupthink.

Furthermore, according to the approach proposed by Daniel Kahneman, it is important to ask several critical questions during decision-making processes: Are personal interests, overconfidence, or excessive reliance on previous experiences influencing the decision-maker? Are different opposing viewpoints and independent analyses sufficiently represented in the process? These questions help develop critical thinking and reduce cognitive biases.

Moreover, Soll, Milkman, and Payne (2015) suggest several practical methods for reducing cognitive biases. These include blinding (objective evaluation through hiding irrelevant information), checklists, and algorithmic approaches. Such methods help reduce subjective judgments and improve objective decision-making.

Overall, people make numerous decisions every day, and many of these decisions may be shaped by cognitive biases. Therefore, understanding, analyzing, and protecting oneself from cognitive biases is extremely important in modern society. Developing critical thinking skills and increasing caution in decision-making processes can help individuals achieve more accurate and effective outcomes.

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THE METHODOLOGY OF USING DIGITAL TECHNOLOGIES IN DEVELOPING THE PROFESSIONAL COMPETENCE OF FUTURE INFORMATICS TEACHERS

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Abstract. *The rapid digitalization of education has significantly transformed the professional training of future teachers. In particular, the preparation of future informatics teachers requires the effective integration of digital technologies into pedagogical processes. This article examines the methodological foundations of using digital technologies in developing the professional competence of future informatics teachers. The study analyzes international standards, modern pedagogical approaches, and the role of digital educational environments in higher education. The research is based on competency-based, integrative, and activity-oriented approaches. The findings demonstrate that the systematic use of digital technologies enhances students' pedagogical creativity, technological literacy, independent learning abilities, and professional readiness. The article also proposes methodological recommendations for integrating digital platforms, electronic educational resources, and interactive technologies into teacher education programs.*

Keywords: *digital technologies, professional competence, informatics teachers, digital pedagogy, higher education, ICT, digital learning environment, teacher training, educational technologies, digital literacy.*

Introduction

The digital transformation of modern society has created substantial changes in the educational system. Today, educational institutions are expected to prepare highly qualified specialists capable of working effectively in digital environments. These changes are especially important in the preparation of future informatics teachers, whose professional activities are directly connected with information technologies and digital educational tools.

Modern teachers are no longer limited to traditional instructional methods. Instead, they are expected to organize interactive learning environments, create electronic educational resources, use online platforms, and support students' independent learning through digital technologies. Therefore, the development of professional competence among future informatics teachers has become one of the priority tasks of higher education institutions.

Professional competence is considered an integrated system of theoretical knowledge, practical skills, pedagogical abilities, and personal qualities necessary for successful professional activity. In the context of digital education, professional competence also includes digital literacy, technological creativity, media competence, and the ability to effectively use digital educational resources.

International educational organizations emphasize the importance of integrating digital technologies into teacher education. UNESCO ICT Competency Framework for Teachers, DigCompEdu, and ISTE Standards define modern teachers as digitally competent professionals

capable of using innovative technologies in educational practice. These frameworks stress that digital competence should become an essential component of teacher professional development.

Despite ongoing reforms in teacher education, practical observations indicate that future informatics teachers often experience difficulties in effectively integrating digital technologies into pedagogical activities. In many cases, students possess theoretical technological knowledge but lack methodological skills related to digital pedagogy and interactive teaching strategies.

This situation demonstrates the need for improved methodologies aimed at developing the professional competence of future informatics teachers through digital technologies. Therefore, the purpose of this article is to analyze the methodological foundations of using digital technologies in developing the professional competence of future informatics teachers and to identify effective pedagogical approaches for higher education institutions.

Research Methodology

The research was conducted using competency-based, systemic, integrative, and activity-oriented approaches. These approaches allowed the study to examine the development of professional competence as a multidimensional pedagogical process. The competency-based approach was used to identify the key competencies required for future informatics teachers in digital educational environments. The systemic approach enabled the analysis of relationships between educational goals, methods, digital technologies, and learning outcomes. The integrative approach played a significant role in combining informatics, pedagogy, and digital technologies into a unified educational framework. Meanwhile, the activity-oriented approach emphasized practical learning activities, collaborative work, and project-based learning.

The following research methods were applied:

analysis of scientific and pedagogical literature;

comparative analysis;

pedagogical observation;

questionnaires and interviews;

experimental teaching;

statistical analysis.

International frameworks such as DigCompEdu, UNESCO ICT Competency Framework for Teachers, TPACK, and SAMR models served as the methodological basis of the study. Experimental work was carried out in higher pedagogical education institutions involving future informatics teachers. Control and experimental groups were organized to evaluate the effectiveness of digital technologies in developing professional competence.

Digital technologies have become an essential part of modern education. They provide new opportunities for organizing teaching and learning processes, supporting interactive communication, and improving educational quality.

For future informatics teachers, digital technologies perform several important functions:

facilitating access to educational resources;

supporting independent learning;

improving communication and collaboration;

developing technological and pedagogical skills;

encouraging creativity and innovation.

Digital technologies also help create flexible learning environments where students can actively participate in educational activities. Online platforms, virtual laboratories, multimedia resources, and interactive applications increase students' motivation and engagement. Modern

digital educational environments differ significantly from traditional classroom settings. They are characterized by flexibility, accessibility, interactivity, and learner-centered approaches. Therefore, future informatics teachers must learn how to organize educational activities within digital environments effectively.

The research identified several structural components of professional competence among future informatics teachers.

Motivational Component

The motivational component reflects students' interest in professional development, innovative teaching methods, and digital technologies. Motivation is considered a key factor influencing successful professional growth. The study showed that students who actively participated in digital learning activities demonstrated higher levels of engagement and creativity.

Cognitive Component

The cognitive component includes theoretical knowledge related to informatics, pedagogy, educational technologies, digital literacy, and instructional methodologies. Students are expected to possess knowledge in: programming; information technologies; digital pedagogy; online learning systems; educational resource design. The findings revealed that theoretical knowledge alone is insufficient without practical pedagogical application.

Technological Component

The technological component involves practical skills related to digital tools and educational technologies. Future informatics teachers should be able to:

create digital educational resources;

work with learning management systems;

organize online learning activities;

use multimedia technologies;

integrate interactive tools into teaching practice.

The research demonstrated that practical technological activities significantly improve students' professional readiness.

Reflective Component

The reflective component includes self-assessment, critical thinking, and professional self-improvement. Reflection helps future teachers evaluate their teaching methods and identify ways to improve professional performance. Students participating in reflective activities showed higher levels of pedagogical awareness and professional confidence. The study developed a methodology for integrating digital technologies into the professional training of future informatics teachers.

The methodology includes several stages:

diagnostic stage;

formative stage;

evaluative stage.

At this stage, students' initial levels of digital literacy and professional competence were assessed. Questionnaires, interviews, and practical tasks were used to identify students' strengths and weaknesses.

Results and Discussion

The results showed that many students possessed basic technological skills but lacked experience in digital pedagogy and interactive teaching. During the formative stage, students participated in practical activities involving digital technologies. Educational tasks included:

creating electronic educational resources;

designing interactive presentations;
developing online assignments;
using virtual laboratories;
organizing collaborative digital projects.
Several digital platforms were integrated into the learning process, including:
Moodle;
Google Classroom;
Canva;
Quizizz;
LearningApps.

Project-based learning and collaborative learning methods were actively used during practical sessions.

The evaluative stage focused on assessing the effectiveness of the methodology. Students' professional competence was evaluated according to several criteria: technological skills; pedagogical creativity; digital literacy; independent learning abilities; reflective thinking.

The results demonstrated positive changes in students' professional competence after participating in the experimental activities.

The experimental work confirmed the effectiveness of using digital technologies in developing the professional competence of future informatics teachers.

Students in the experimental group demonstrated significant improvements in: digital literacy; technological competence; pedagogical creativity; collaborative skills; independent learning; reflective abilities.

The use of digital educational resources and interactive technologies increased students' motivation and professional engagement. Moreover, students became more confident in organizing digital learning activities and integrating technological tools into educational practice.

The comparative analysis between control and experimental groups showed that the proposed methodology had a positive impact on students' professional development. The findings of this study support international research emphasizing the importance of digital technologies in teacher education. Modern educational environments require teachers who can effectively integrate technological tools into pedagogical activities.

The research also demonstrates that professional competence development should involve both theoretical and practical components. Digital technologies should not be used merely as technical tools; instead, they should become instruments for improving educational quality and supporting student-centered learning.

Interactive methods, collaborative activities, project-based learning, and digital educational environments contribute significantly to the professional growth of future informatics teachers.

Furthermore, the study confirms that higher education institutions should modernize teacher training programs to meet the demands of digital transformation.

Conclusion

The development of professional competence among future informatics teachers is one of the key priorities of modern teacher education. Digital technologies play an essential role in this process by creating innovative educational environments and supporting interactive learning activities. The research demonstrated that the systematic use of digital technologies significantly improves students' technological skills, pedagogical creativity, independent learning abilities, and

professional readiness. The study concludes that effective professional training of future informatics teachers requires:

integration of digital technologies into educational practice;
competency-based teacher education;
practical technological activities;
interactive teaching methods;
reflective learning environments.

The proposed methodology can be effectively implemented in higher pedagogical education institutions to improve the quality of teacher training and prepare future informatics teachers for professional activity in digital educational environments.

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IS THE PREPARATION OF FUTURE TEACHERS FOR PROFESSIONAL ACTIVITY BASED ON COACHING TECHNOLOGIES A MECHANISM FOR FORMATION AS A PEDAGOGICAL PROBLEM?

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Abstract. *In this article, the main task of the current education system is to train specialists who can meet the needs of society, think independently in their professional activities, develop their own capabilities, and have modern views. Therefore, we believe that it is difficult to achieve such a result only through traditional teaching methods. According to the qualification requirements of the bachelor's degree in additional education, the future teacher's professional activity is determined as follows: to carry out pedagogical activities in the status of a teacher of education in general secondary education in accordance with the professional standard of a general secondary school teacher, to carry out pedagogical activities in the status of a teacher of education in general secondary education, to carry out pedagogical activities in the status of a teacher of education in general secondary education. The study of general cultural, professional and subject-specific competencies expressed in the content of the requirements for professional competencies of bachelors in the field of additional education teacher education in this normative document reflects the relevance of using the capabilities of coaching technologies in preparing future teachers for professional activity.*

Keywords: *professional competence, reflexive skills, real time, equality, coaching process, mechanism, innovative, creative.*

INTRODUCTION

As a modern approach in the global education system, wide attention is being paid to the implementation of technologies aimed at improving the professional training of teachers in educational practice. This process involves the development of not only theoretical knowledge and methodological skills of the teacher, but also the formation and systematization of his personal potential, reflexive culture, and collaborative activities.

The conference, organized by various international organizations, including UNESCO's International Institute for Educational Planning and hosted by the Regional Center for Educational Innovation and Technology (INNOTECH) of the Southeast Asian Ministers of Education Organization (SEAMEO), brings together educational planning leaders from across the region to create a new collaborative agenda for educational planning and management in the Asia-Pacific region. The regional conference covered the current challenges of educational planning and management in the Asia-Pacific region, as well as the analysis of promising approaches and effective experiences, issues of quality of education, equity and well-being, the impact of governance and digitalization on the education system, the sustainability of the education system in times of crises and climate change, the development of expanded and updated cooperation networks on educational planning for the Asia-Pacific region, the development of new

mechanisms for the exchange of experiences, as well as the strengthening of regional integration processes and the introduction of innovative management practices. This reflects the urgency of improving the content of the application of coaching technologies in the process of preparing future educators for professional activity based on the study of the specifics of their application in the educational process.

In the world education system, the processes of expanding international cooperation within the framework of socio-cultural, humanitarian and scientific research, deepening cultural and socio-ethical relations, forming innovative educational ties and launching scientific projects implemented on the basis of international programs are increasingly expanding. At the same time, the issue of improving the professional training of teachers, increasing their methodological and technological potential through the development of integrative cooperation in such relevant areas as education, healthcare, culture and ecology is of particular importance. In particular, the organization of professional activities based on coaching technologies strengthens the reflexive approach of teachers and serves to develop professional competence. Also, large-scale scientific research is being conducted in higher educational institutions to study professional relations, introduce coaching technologies into the pedagogical process, develop innovative methods and technologies aimed at implementing advanced practices in practice, and strengthen socio-didactic relations between teachers and students on a technological and methodological basis.

In recent years, large-scale reforms have been implemented in our republic to radically improve the quality of the higher education system and bring the educational process into line with international standards. In particular, regulatory, legal and methodological foundations have been created to improve the professional training of future teachers of education, strengthen their theoretical knowledge and practical skills. These reforms are aimed at increasing the effectiveness of education, developing the professional competence of teachers, introducing innovative pedagogical technologies into the educational process and forming a flexible approach to the individual needs of students, and are creating the basis for a qualitatively new level of modern pedagogical activity. “Training professional pedagogical personnel who have mastered the methods of education and training, information and communication technologies and foreign languages, and have the skills to use modern pedagogical technologies in the educational process, identifying young people with a high interest in the pedagogical profession and introducing a continuous system of their targeted training and education, improving the quality of education by ensuring the harmony of education, science and production in the field, training competitive personnel, and effectively organizing scientific and innovative activities” were identified as priority tasks. This situation expands the possibilities of clarifying the pedagogical and psychological characteristics and pedagogical conditions of professional development based on coaching technologies in future teachers, and improving the content and model of professional training for students based on the coaching approach.

Decrees of the President of the Republic of Uzbekistan No. PF-60 dated January 28, 2022 “On the Development Strategy of New Uzbekistan for 2022-2026”, No. PF-134 dated May 11, 2022 “On Approval of the National Program for the Development of Public Education in 2022-2026”, No. PF-5847 dated October 8, 2019 “On Approval of the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030”, No. PQ-289 dated June 21, 2022 “On Measures to Improve the Quality of Pedagogical Education and Further Develop the Activities of Higher Educational Institutions Training Pedagogical Personnel”, No. PQ-2909 dated April 20, 2017 The resolutions of the Cabinet of Ministers of the Republic of Uzbekistan No. 1059

dated December 31, 2019 “On measures to further develop the higher education system”, No. PQ-3775 dated June 5, 2018 “On additional measures to improve the quality of education in higher education institutions and ensure their active participation in the comprehensive reforms being implemented in the country”, No. 422 dated July 6, 2020 “On measures to gradually introduce the subject of “Education” into practice in general secondary educational institutions” and other regulatory legal acts related to this activity serve to ensure the implementation of the tasks set forth in them.

LITERATURE ANALYSIS AND METHODOLOGY

The issues of pedagogical technologies, educational technologies, interactive methods, the use of reflexive methods, coaching technologies, coaching, the pedagogical foundations of coaching technologies, the innovative role of coaching technologies, the integration of coaching methods and the formation of a teacher as a professional, professional formation, factors of professional training, pedagogical facilitation in the professional training of future teachers, and mentoring methodologies in the process of higher education have been studied by our scientists S.Abdullaeva, N.Avliyokulov, N.Azizkhodzhayeva, L.Bektursynova, A.Jurayev, M.Jumayeva, D.Karimova, N.Madrahimov, N.Muslimov, N.Norkulova, G.Otaboyeva, U.Rasulov, O'.Tolipov, I.Tursunov, N.Khakimova, M.Khalilova, Q.Yo'ldoshev, O.Yo'ldosheva.

The research of scientists from the Commonwealth of Independent States (CIS) countries, such as O. Baranova, V. Belikov, G. Chizhakova, U. Graham, Sh. Karimova, M. Klarin, T. Kureneva, N. Nikulina, I. Nosova, M. Rutkovskaya, V. Shagaeva, V. Slastyonin, A. Torbeeva, V. Volodin, etc., covers the professional activities of a teacher, motivational factors of professional training, the role and essence of coaching in education and upbringing, coaching, development of coaching activities as a profession, group psychoanalytic coaching, coaching approach in education, methodological importance of coaching in developing the professional potential of teachers, project activities of a teacher and coaching, coaching as a mechanism for ensuring the innovative activities of a teacher.

Another important aspect of the active application of coaching technologies in the process of preparing future teachers for professional activity is explained by the optimization of the formation of effective communication and empathetic attitudes in learners. That is, the coaching process, based on listening, asking the right questions and active dialogue, guarantees effective communication for future teachers with students, colleagues and parents, helps to understand their emotional needs more deeply. The studies of M. Kraft, D. Blazor, D. Hogan show that teachers trained through coaching use more innovative approaches to teaching compared to traditional methods, which can lead to significant positive changes in student learning.

DISCUSSION AND RESULTS

In the training of pedagogical personnel, the main emphasis is often placed on imparting theoretical knowledge and their application in practical activities. However, in real professional activities, it is impossible not to take into account such aspects as independent thinking, decision-making in various personal and professional situations, creative problem solving, the ability to direct one's own professional development, effective communication and cooperation that are required of a teacher. Coaching is an effective collaborative process aimed at revealing a person's hidden potential, achieving personal and professional goals, as well as continuous self-development, which has a positive effect on the formation of not only the necessary knowledge and skills in future teachers, but also such qualities as critical analysis, creative problem solving,

effective communication and personal responsibility. However, there are a number of problems that need to be solved in this promising direction.

As part of our research, we will address the theoretical, practical, and methodological difficulties directly related to the process of preparing future teachers for professional activity based on coaching technologies:

1. Professors and teachers of higher educational institutions operate on the basis of traditional pedagogical methodologies that they have studied, and most of them do not have sufficient knowledge and practical skills in the theoretical foundations, practical methods and techniques of coaching. Coaching is not just a training or lecture, but a process that requires deep professional competence. The need to improve the process of preparing future teachers for professional activity on the basis of coaching technologies is primarily related to the systematic training, retraining and regular improvement of the skills of teaching professors and teachers in coaching. However, today the practice of introducing such programs is limited to professional development and professional retraining courses, which leads to a lack of pedagogical personnel capacity to successfully apply coaching technologies.

2. We can see that the content of coaching technologies in existing curricula is not sufficiently reflected in the content of modules due to gaps in curricula and methodological support. For high-quality training of future teachers on the basis of coaching, it is necessary to integrate special training courses, practice-oriented coaching sessions and situational tasks into the educational process. In this case, the lack of high-quality educational and methodological materials, textbooks, manuals, electronic resources and sets of practical exercises created on the basis of coaching principles is a serious problem.

3. A supportive, open, and developmental learning environment is essential for the coaching approach, and a traditional, authoritarian, and evaluation-oriented environment may conflict with the principles of coaching. In this regard, creating an environment that allows students to think freely, make mistakes, and learn from their mistakes requires a rethinking of the views of most educational institutions and faculty.

4. Preparing future teachers for professional activity based on coaching technologies creates the need to improve the system of assessing students' knowledge. Current assessment systems are mainly aimed at checking how much a student has mastered knowledge. However, personal competencies developed through coaching, such as reflexivity, problem-solving skills, Assessing skills such as initiative through traditional methods is challenging. Therefore, it is appropriate to review the assessment system and introduce mechanisms that are competency-based, track growth, and encourage self-assessment.

5. Future teachers should have sufficient opportunities to apply coaching skills in real pedagogical situations, for example, during internships in schools. That is, the gap between theoretical knowledge and practical skills in pedagogical education raises the possibility that coaching can also be an obstacle to its implementation.

6. The lack of sufficient scientific research on the content of training future teachers for professional activity based on coaching technologies, the lack of textbooks and manuals, etc., make it necessary to scientifically study this problem.

In order to effectively solve these problems, it is important to take a comprehensive approach, improve the coaching skills of teachers working in higher education, implement coaching technologies in the content of educational modules based on modern requirements, that is, create conditions for their wide penetration into the educational audience, and focus on training

innovative, creative, and committed teachers capable of adapting to constantly changing requirements through the introduction of foreign best practices and the full integration of coaching into the pedagogical education system.

In the scientific and research activities of a future teacher of education, it is required to conduct research in the field of pedagogy, to be able to directly apply information on pedagogy and education in practice, to prepare scientific and research works, to have the skills of systematic analysis of scientific data. These tasks require the future specialist to master the competencies related to analytical thinking, independent research, reflexive thinking, social empathy, research of advanced methods and technologies, and the ability to use educational and educational tools on their own. From this point of view, the use of coaching technologies in scientific and research activities, first of all, develops the skills of independent thinking, the ability to see a scientific problem, and the ability to reflexively analyze the process, which are important for scientific research. This will help the future teacher to think based on scientific evidence, to connect theory with practice strengthens their abilities. One of the most important tasks today is to prepare future teachers not only as knowledgeable, but also as spiritually mature, socially responsible and professional individuals. In this process, the integral integration of coaching technologies and spiritual and educational activities is of particular importance.

A unique aspect of the teaching profession is that, in addition to imparting knowledge, it also involves educating individuals. Therefore, it is natural to put forward the requirement that a future teacher should have high spiritual and moral values, patriotism, national pride, and tolerance.

However, despite these advantages, it was found that there are a number of problematic situations associated with the use of coaching technologies in spiritual and educational activities:

However, despite these advantages, a number of problematic situations related to the use of coaching technologies in spiritual and educational activities were identified:

- The coaching process should take into account the interests, values, and goals of each student;
- Coaching technologies are usually aimed at personal development and require new methodologies based on national values;

It is determined that the future teacher of education should be able to develop mechanisms for monitoring and assessing the quality of educational processes in organizational and managerial activities, organize and manage social and spiritual and educational work in a team, make the right decisions in conditions of different opinions, draw up a work plan for the activities being performed, monitor and evaluate the results of the work carried out. Through coaching sessions, the future teacher determines his goals and plans, learns strategic thinking.

CONCLUSION AND SUGGESTIONS

Within the framework of our research, the clarification of the pedagogical and psychological characteristics of preparing future teachers for professional activity based on coaching technologies requires an analysis of the content of the concepts of “coaching” and “coaching technologies”. The following is an analysis of these concepts. In our opinion, the reflexive-value component reflects the formation of a system of personal and professional values

of future teachers of education, the ability to analyze their own experience, evaluate their activities, a high level of aspiration for purposeful self-development, and a responsible approach to pedagogical activity. This component also implies planning positive changes through a critical approach to their activities based on coaching, adherence to the principles of national values, humanity, mutual respect, responsibility, and cooperation in educational activities, and the ability to maintain a moral and psychological balance between future teachers and educators.

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THE NEED TO DEVELOP STUDENTS' ECOLOGICAL SAFETY COMPETENCES

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Abstract. *This article examines the need to develop students' ecological safety competencies in the context of sustainable development and environmental education. It emphasizes that modern education should not only provide theoretical knowledge about nature protection but also form responsible ecological behavior, practical skills, and ethical attitudes toward the environment. The study analyzes the legal and pedagogical foundations of ecological education in Uzbekistan, including national resolutions and the Concept for the Development of Environmental Education. Special attention is given to higher education, where future specialists must be prepared to assess ecological risks, make responsible decisions, and act effectively in changing environmental conditions. The article concludes that ecological culture and safety competence are essential for sustainable social and environmental development.*
Keywords: *smarteducation, creativity, thinking, research, adaptive, competence, professional competence, theoretical and methodological.*

Introduction

The text discusses the importance of sustainable development, environmental education, and ecological culture in the 21st century. Its main idea is that the progress of humanity can no longer be measured only by economic growth; it must also include maintaining harmony between society and nature. Therefore, environmental safety and sustainable development have become global priorities.

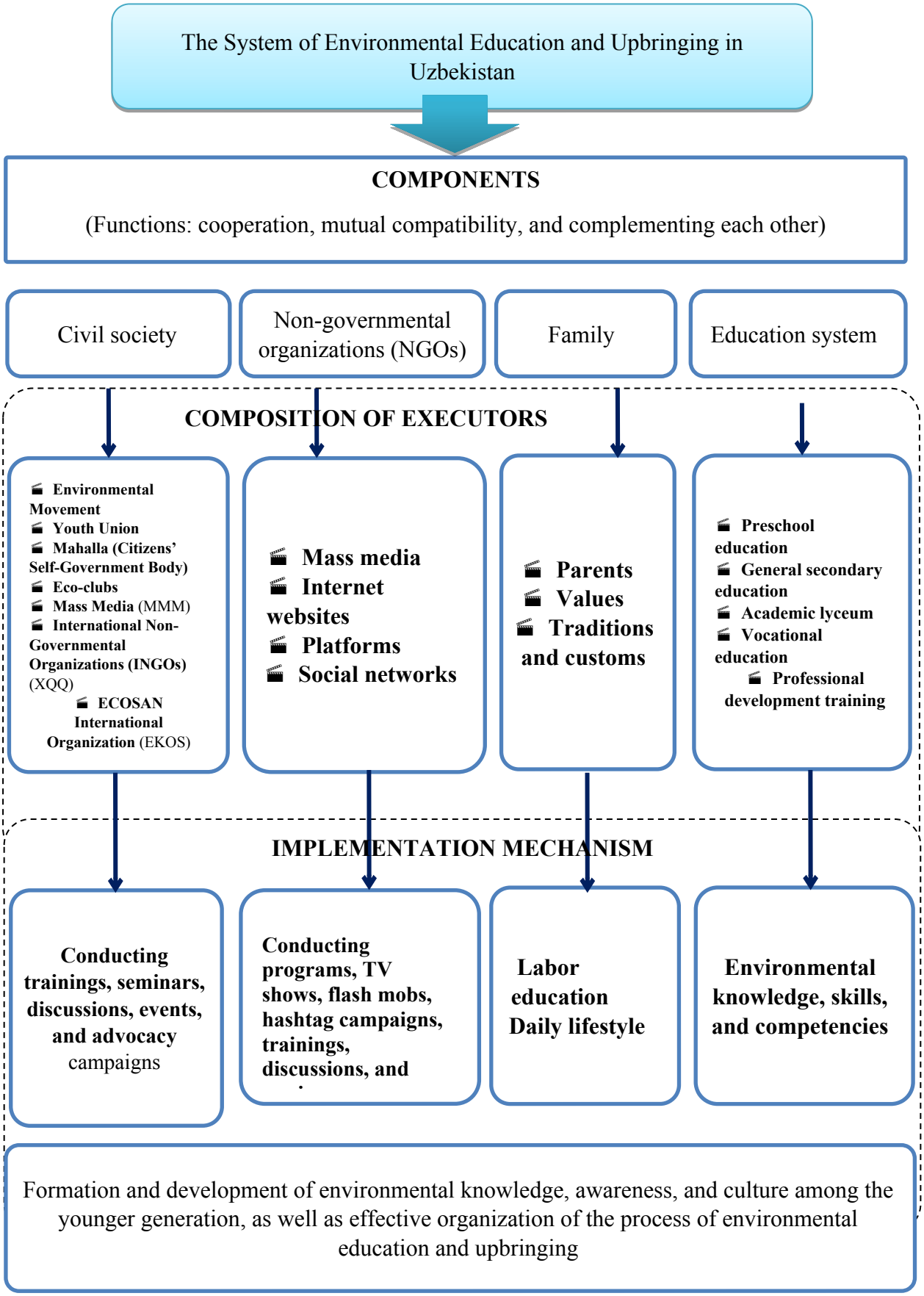
The author also highlights the legal foundations of environmental education. In particular, the Law "On Nature Protection" of Republic of Uzbekistan states that environmental education is compulsory in all educational institutions. This is aimed at developing a responsible attitude toward the environment among younger generations.

The text distinguishes between the concepts of environmental education and ecological culture. Environmental education is described as the process of forming knowledge, understanding, thinking, skills, and competencies. Ecological culture, however, is the practical expression of this knowledge in a person's behavior, ethics, and daily activities. In other words, having environmental knowledge alone is not enough; individuals must also demonstrate environmentally responsible behavior in practice.

The author analyzes definitions of ecological culture proposed by various scholars and points out some shortcomings in them. In particular, ecological culture should not be limited only to knowledge and awareness but must also be reflected in real-life actions and behavior. The text notes that although students often possess environmental knowledge, this knowledge does not always become part of their everyday lifestyle and practical habits.

The article further explains that one of the major tasks of modern technical education is to prepare specialists who can ensure environmental safety, adapt to rapidly changing environmental conditions, and make effective decisions in emergency situations. As an example, the text

mentions that educational institutions in Russia teach subjects such as biodiversity, geoecology, environmental monitoring, ecological risks, and sustainable development.



In conclusion, the text emphasizes that environmental education and ecological culture are essential for the sustainable future of humanity. Maintaining harmony between humans and nature requires not only knowledge but also practical responsibility and ethical behavior.

Methodology

This study uses a theoretical and descriptive research design. The research is based on the analysis of legal documents, scientific literature, and pedagogical sources related to environmental education, ecological culture, and ecological safety competence. The study applies document analysis, comparative analysis, and conceptual analysis to identify the role of ecological safety competence in higher education.

Results and Discussion

The Cabinet of Ministers of Republic of Uzbekistan adopted Resolution No. 434 on May 27, 2019, titled "On Approval of the Concept for the Development of Environmental Education in the Republic of Uzbekistan."

Chapter 6 of the Concept is entitled "Improvement of Environmental Education in the Higher Education System" and identifies the following main tasks:

- The curriculum and subject programs of the bachelor's degree program 5630100 – "Ecology and Environmental Protection" will be improved based on ongoing reforms in the field of ecology and the application of modern pedagogical technologies.
- Proposals will be developed to introduce new fields and specialties into the "Classifier of Higher Education Areas and Specialties" according to the current environmental situation, as well as the demands, recommendations, and workforce needs of ministries and agencies.
- The content of ecology and environmental protection subjects in bachelor's and master's degree programs related to environmental studies will be strengthened and enriched with additional topics. Students will receive the required knowledge and develop necessary skills and competencies according to the curriculum.
- In non-environmental fields of study, topics related to ecology and environmental protection will be incorporated into relevant subjects and regularly updated in accordance with scientific achievements, new technologies, and research findings.
- Master's theses in the field of ecology and environmental protection will be prepared, and scientific research will be conducted on modern and relevant scientific-practical issues.
- In non-environmental educational fields, master's theses will also address ecological and environmental protection issues relevant to the specific specialization and logically connected to the main research topic.
- Practical training classes at higher educational institutions will be organized directly at large industrial enterprises, research institutions, water management organizations, nature reserves, environmentally affected regions, and other ecology-related institutions.
- Existing environmental websites on the Internet will be enriched with materials that attract students' interest, and various competitions such as "Author of the Most Interesting Article" and "Author of the Most Relevant Material" will be organized.
- Special sections dedicated to ecology and environmental protection will be opened in university periodicals, newspapers, and scientific journals, where scientific articles by professors, master's students, and students will be published.

- "Eco-clubs" will be established in higher educational institutions and student dormitories, annual plans for their activities will be developed, and their functioning will be supported.
- Environmental social media pages and online discussion platforms will be created, including messenger groups and internet platforms to encourage communication among young people. Through these platforms, activities such as flash mobs, hashtags, and other environmentally themed events appealing to youth will be regularly organized.

Conclusion

This article concludes that developing students' ecological safety competencies is an essential task of modern education. Environmental knowledge alone is not sufficient unless it becomes part of students' behavior, decision-making, and professional responsibility. The analysis shows that ecological culture should combine theoretical understanding, practical skills, ethical awareness, and active participation in nature protection. National documents in Uzbekistan also emphasize the importance of improving environmental education at all levels, especially in higher education. Therefore, universities should enrich curricula, organize practice-oriented learning, support eco-clubs, and encourage research on ecological problems. Strengthening ecological safety competence will help future specialists respond effectively to environmental risks and contribute to sustainable development. In this way, education can connect ecological awareness with real social and professional action.

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THE METHODOLOGY OF USING DIGITAL TECHNOLOGIES IN DEVELOPING THE PROFESSIONAL COMPETENCE OF FUTURE INFORMATICS TEACHERS

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Abstract. *The rapid digitalization of education has significantly transformed the professional training of future teachers. In particular, the preparation of future informatics teachers requires the effective integration of digital technologies into pedagogical processes. This article examines the methodological foundations of using digital technologies in developing the professional competence of future informatics teachers. The study analyzes international standards, modern pedagogical approaches, and the role of digital educational environments in higher education. The research is based on competency-based, integrative, and activity-oriented approaches. The findings demonstrate that the systematic use of digital technologies enhances students' pedagogical creativity, technological literacy, independent learning abilities, and professional readiness. The article also proposes methodological recommendations for integrating digital platforms, electronic educational resources, and interactive technologies into teacher education programs.*

Keywords*: digital technologies, professional competence, informatics teachers, digital pedagogy, higher education, ICT, digital learning environment, teacher training, educational technologies, digital literacy.*

Introduction

The digital transformation of modern society has created substantial changes in the educational system. Today, educational institutions are expected to prepare highly qualified specialists capable of working effectively in digital environments. These changes are especially important in the preparation of future informatics teachers, whose professional activities are directly connected with information technologies and digital educational tools.

Modern teachers are no longer limited to traditional instructional methods. Instead, they are expected to organize interactive learning environments, create electronic educational resources, use online platforms, and support students' independent learning through digital technologies. Therefore, the development of professional competence among future informatics teachers has become one of the priority tasks of higher education institutions.

Professional competence is considered an integrated system of theoretical knowledge, practical skills, pedagogical abilities, and personal qualities necessary for successful professional activity. In the context of digital education, professional competence also includes digital literacy, technological creativity, media competence, and the ability to effectively use digital educational resources.

International educational organizations emphasize the importance of integrating digital technologies into teacher education. UNESCO ICT Competency Framework for Teachers, DigCompEdu, and ISTE Standards define modern teachers as digitally competent professionals

capable of using innovative technologies in educational practice. These frameworks stress that digital competence should become an essential component of teacher professional development.

Despite ongoing reforms in teacher education, practical observations indicate that future informatics teachers often experience difficulties in effectively integrating digital technologies into pedagogical activities. In many cases, students possess theoretical technological knowledge but lack methodological skills related to digital pedagogy and interactive teaching strategies.

This situation demonstrates the need for improved methodologies aimed at developing the professional competence of future informatics teachers through digital technologies. Therefore, the purpose of this article is to analyze the methodological foundations of using digital technologies in developing the professional competence of future informatics teachers and to identify effective pedagogical approaches for higher education institutions.

Research Methodology

The research was conducted using competency-based, systemic, integrative, and activity-oriented approaches. These approaches allowed the study to examine the development of professional competence as a multidimensional pedagogical process. The competency-based approach was used to identify the key competencies required for future informatics teachers in digital educational environments. The systemic approach enabled the analysis of relationships between educational goals, methods, digital technologies, and learning outcomes. The integrative approach played a significant role in combining informatics, pedagogy, and digital technologies into a unified educational framework. Meanwhile, the activity-oriented approach emphasized practical learning activities, collaborative work, and project-based learning.

The following research methods were applied:

analysis of scientific and pedagogical literature;

comparative analysis;

pedagogical observation;

questionnaires and interviews;

experimental teaching;

statistical analysis.

International frameworks such as DigCompEdu, UNESCO ICT Competency Framework for Teachers, TPACK, and SAMR models served as the methodological basis of the study. Experimental work was carried out in higher pedagogical education institutions involving future informatics teachers. Control and experimental groups were organized to evaluate the effectiveness of digital technologies in developing professional competence.

Digital technologies have become an essential part of modern education. They provide new opportunities for organizing teaching and learning processes, supporting interactive communication, and improving educational quality.

For future informatics teachers, digital technologies perform several important functions:

facilitating access to educational resources;

supporting independent learning;

improving communication and collaboration;

developing technological and pedagogical skills;

encouraging creativity and innovation.

Digital technologies also help create flexible learning environments where students can actively participate in educational activities. Online platforms, virtual laboratories, multimedia resources, and interactive applications increase students' motivation and engagement. Modern

digital educational environments differ significantly from traditional classroom settings. They are characterized by flexibility, accessibility, interactivity, and learner-centered approaches. Therefore, future informatics teachers must learn how to organize educational activities within digital environments effectively.

The research identified several structural components of professional competence among future informatics teachers.

Motivational Component

The motivational component reflects students' interest in professional development, innovative teaching methods, and digital technologies. Motivation is considered a key factor influencing successful professional growth. The study showed that students who actively participated in digital learning activities demonstrated higher levels of engagement and creativity.

Cognitive Component

The cognitive component includes theoretical knowledge related to informatics, pedagogy, educational technologies, digital literacy, and instructional methodologies. Students are expected to possess knowledge in: programming; information technologies; digital pedagogy; online learning systems; educational resource design. The findings revealed that theoretical knowledge alone is insufficient without practical pedagogical application.

Technological Component

The technological component involves practical skills related to digital tools and educational technologies. Future informatics teachers should be able to:

create digital educational resources;

work with learning management systems;

organize online learning activities;

use multimedia technologies;

integrate interactive tools into teaching practice.

The research demonstrated that practical technological activities significantly improve students' professional readiness.

Reflective Component

The reflective component includes self-assessment, critical thinking, and professional self-improvement. Reflection helps future teachers evaluate their teaching methods and identify ways to improve professional performance. Students participating in reflective activities showed higher levels of pedagogical awareness and professional confidence. The study developed a methodology for integrating digital technologies into the professional training of future informatics teachers.

The methodology includes several stages:

diagnostic stage;

formative stage;

evaluative stage.

At this stage, students' initial levels of digital literacy and professional competence were assessed. Questionnaires, interviews, and practical tasks were used to identify students' strengths and weaknesses.

Results and Discussion

The results showed that many students possessed basic technological skills but lacked experience in digital pedagogy and interactive teaching. During the formative stage, students participated in practical activities involving digital technologies. Educational tasks included:

creating electronic educational resources;

designing interactive presentations;
developing online assignments;
using virtual laboratories;
organizing collaborative digital projects.
Several digital platforms were integrated into the learning process, including:
Moodle;
Google Classroom;
Canva;
Quizizz;
LearningApps.

Project-based learning and collaborative learning methods were actively used during practical sessions.

The evaluative stage focused on assessing the effectiveness of the methodology. Students' professional competence was evaluated according to several criteria: technological skills; pedagogical creativity; digital literacy; independent learning abilities; reflective thinking.

The results demonstrated positive changes in students' professional competence after participating in the experimental activities.

The experimental work confirmed the effectiveness of using digital technologies in developing the professional competence of future informatics teachers.

Students in the experimental group demonstrated significant improvements in: digital literacy; technological competence; pedagogical creativity; collaborative skills; independent learning; reflective abilities.

The use of digital educational resources and interactive technologies increased students' motivation and professional engagement. Moreover, students became more confident in organizing digital learning activities and integrating technological tools into educational practice.

The comparative analysis between control and experimental groups showed that the proposed methodology had a positive impact on students' professional development. The findings of this study support international research emphasizing the importance of digital technologies in teacher education. Modern educational environments require teachers who can effectively integrate technological tools into pedagogical activities.

The research also demonstrates that professional competence development should involve both theoretical and practical components. Digital technologies should not be used merely as technical tools; instead, they should become instruments for improving educational quality and supporting student-centered learning.

Interactive methods, collaborative activities, project-based learning, and digital educational environments contribute significantly to the professional growth of future informatics teachers.

Furthermore, the study confirms that higher education institutions should modernize teacher training programs to meet the demands of digital transformation.

Conclusion

The development of professional competence among future informatics teachers is one of the key priorities of modern teacher education. Digital technologies play an essential role in this process by creating innovative educational environments and supporting interactive learning activities. The research demonstrated that the systematic use of digital technologies significantly improves students' technological skills, pedagogical creativity, independent learning abilities, and

professional readiness. The study concludes that effective professional training of future informatics teachers requires:

integration of digital technologies into educational practice;
competency-based teacher education;
practical technological activities;
interactive teaching methods;
reflective learning environments.

The proposed methodology can be effectively implemented in higher pedagogical education institutions to improve the quality of teacher training and prepare future informatics teachers for professional activity in digital educational environments.

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DEVELOPMENT OF THE CONTENT AND METHODS OF TRAINING FUTURE TEACHERS TO EFFECTIVELY ORGANIZE EDUCATIONAL LESSONS

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Abstract. *In this article, the social competence of a teacher of the subject "Education" is a form of social work, which is manifested in pedagogical work with the population, colleagues, students and their parents. We note that the difference between a professional teacher of the subject "Education" and a citizen, a person who intuitively, and sometimes impulsively, guides, exerts an educational influence based on personal experience and professional requirements, is primarily manifested in the connection with a clear understanding of the goal, predicting results, theoretical, methodological and technological preparation, constant purposeful work, and work on oneself. The need and essence of the content of the modernization of educational work and social competencies of teachers in our country were substantiated in the Resolution of the Cabinet of Ministers of the Republic of Uzbekistan dated December 31, 2019 No. 1059 "On approval of the concept of continuous spiritual education and measures for its implementation". According to the Resolution The work being carried out in Uzbekistan on the modern basis of scientific and technological reform of youth education requires the formation of scientifically based basic competencies and qualities, based on the needs of today. The task of the teacher of education is to ensure the participation of cognitive and operational components of social competence. This is based on the state educational standard and curricula of general secondary education, it is necessary to form in students, as age-appropriate basic spiritual and moral virtues (competencies), such as loyalty to the Motherland, entrepreneurship, willpower, ideological immunity, kindness, responsibility, tolerance, legal culture, innovative thinking, and hard work. At the same time, in order to restore and further enhance our great spirituality in our country under the conditions of independence, improve the national education system, and harmonize it with the requirements of the times, the issues of bringing the work of training qualified personnel to the level of world standards were considered.*

Keywords: *education, principle of adaptability, pedagogical system, students' educational, physically healthy, component, concept.*

INTRODUCTION

In his Address to the Oliy Majlis, the President of the Republic of Uzbekistan Shavkat Mirziyoyev emphasized that “ we have no right to forget what a unique wealth intellectual and cultural potential is, and that it is crucial to educate and bring to perfection those with rare talents.” Education is not just about teaching certain rules, but also about forming a person’s inner world, attitude to values, and raising him to be a person loyal to the Motherland and useful to the community.

Therefore, educators, especially specialists in primary education, must have a deep knowledge of the discipline of education and be able to effectively apply it in their activities. On August 23, 2019, the Ministry of Public Education, chaired by the President of the Republic of

Uzbekistan Shavkat Mirziyoyev , held a video conference dedicated to the development of the public education system, increasing the qualifications and authority of educators in society, and raising the spirituality of the younger generation. In order to ensure the implementation of the instructions given at the meeting of the Electoral College, a draft resolution of the Cabinet of Ministers “On measures for the gradual introduction of the subject “Education” in general secondary educational institutions” was developed. On July 6, 2020, Resolution No. 422 “On measures for the gradual introduction of the subject “Education” in general secondary educational institutions” was adopted. In accordance with the resolution, the subject “Education” will be introduced in general secondary educational institutions in grades 1–9 from the 2020-2021 academic year, and in grades 10–11 from the 2021-2022 academic year, combining the subjects “Etiquette”, “Sense of the Homeland”, “The Idea of National Independence and Fundamentals of Spirituality” and “History of World Religions”. It will be gradually implemented within the total hours allocated to subjects starting from 2019. The resolution approved the concept of the subject “Education” for students of general secondary educational institutions. Based on the resolution of the President of the Republic of Uzbekistan dated November 6, 2020 No. PQ-4884, a comprehensive program of measures was developed to further improve the fields of education and science . This program sets the task of periodically republishing the “ Education” textbook for grades 1-9, using the works of our great grandfathers .

LITERATURE ANALYSIS AND METHODS

In order for the educational process to "preserve" its uniqueness, "Upbringing, training .. The co-authors of the monograph V.A. Karakovsky, Novikova, Selivanova, and others use another concept proposed by the famous Estonian pedagogue and psychologist O. Yo. Laimce. If we look at the educational process " according to Laimce ", then the educational system does not consist of didactics, but, on the one hand, a psychological-pedagogical system, and on the other - a socio-pedagogical system. 23 This, in turn, affects students not only didactically (through teachers, lessons, textbooks, homework), but also as a social factor, through the involvement of children in the environment; it affects through the relationships that arise between parents, teachers, and children, through the psychological environment that is formed at the very beginning of each lesson.

The concept of "didactic system" has been formed quite strongly in pedagogy. The didactic system of the school is expressed through educational goals, content of study, methods and forms of its organization.Of course, educational goals are also implemented in the teaching process by determining the content of the material being studied, the form and methods of its delivery, etc. But in the logic of the second concept of education, the didactic system itself participates in the didactic system of the educational system, that is, it is its system.

Education is the process of forming the younger generation into useful, morally perfect, spiritually mature and physically healthy individuals for society. This process is an integral part of the activities of every educator , and the discipline of education is especially important in the training of future teachers. The main goal of teaching the discipline of education is to provide future educators with in-depth knowledge of the theory and practice of education, to prepare them as competent educators who can properly organize the educational process, use modern methods and be fully qualified educators.

The essence of this goal is reflected in the following:

- to form knowledge about the content, principles, and laws of the educational process in future teachers;

• to educate them as individuals who are committed to national and universal values and who approach educational activities responsibly;

• to develop skills in the correct application of educational methods and technologies in practice ;

• preparation for the formation of an individual approach in educational work with students.

Future educators will perform the following tasks while studying education:

1. Mastering the theoretical foundations of the educational process. Gaining in-depth knowledge of the goals, objectives, content, principles, methods and tools of education. Familiarity with various educational concepts.

2. Formation of pedagogical thinking. Development of independent thinking skills through analysis of educational situations, identification of the problem and search for ways to solve it.

3. Develop skills in designing and organizing educational work. Learn to create scenarios for educational activities, effectively organize educational work in the classroom and outside the classroom, and conduct activities that prepare students for social life.

4. Acquire knowledge and approaches in the areas of moral, spiritual, aesthetic, ecological and labor education. Prepare to conduct educational work in various areas of education based on modern approaches, national and universal values .

5. Development of pedagogical culture and professional qualities. Formation of professional ethics and aesthetics through familiarization with the teacher's speech, dress code, manners, and rules of conduct .

6.Development of independent creative approach and innovative thinking. Development of skills in applying new methods in educational activities, developing creative projects, and using modern technologies .

By mastering the science of education, a future teacher will be able to organize each lesson in an educational direction and create a positive atmosphere in the classroom.

Is an important component of the pedagogical education system and plays a decisive role in preparing future teachers for professional activity. Through this discipline, the teacher acquires not only theoretical knowledge, but also practical skills and a responsible attitude to educational activities. Therefore, every teacher should study the discipline of education in depth and be able to effectively apply it in his practical activities.

Lectures and theoretical concepts alone are not enough to effectively teach future teachers about education. In this regard, modern, innovative approaches are very effective, including:

• problem-based learning;

• interactive methods (discussion, role-playing games, brainstorming);

• training and group work technology;

• analysis based on real-life situations.

Such approaches not only serve to better master the content of the subject, but also to form in the student the skills to correctly apply the educational approach in real situations.

The factors for organizing primary education lessons based on an innovative approach are the following:

• creating certain conditions for organizing primary education classes based on an innovative approach;

• organizing special training seminars aimed at revealing the essence of interactive methods among teaching staff;

• to achieve their thorough mastery of the basics of pedagogical technology; • to foster in teachers a sense of creative approach to the organization of educational activities;

• to develop skills and competencies in teachers to organize lessons based on a technological approach;

• to ensure that teachers organize educational work based on interactive methods;

• improving teachers' skills in organizing pedagogical activities on a technological basis;

• ensuring the effectiveness of primary education lessons. There are a number of principles for developing the skills of teachers to organize pedagogical activities based on interactive methods.

DISCUSSION AND RESULTS

In today's globalization environment, the education of our country's youth has risen to the level of state policy , and therefore one of our main tasks is to protect the youth, the creators of our future, from various foreign ideas, ideologies and aggressions aimed at capturing the hearts and minds of people. As the President of the Republic of Uzbekistan Shavkat Mirziyoyev noted, “The education of the younger generation has always been important and relevant. However, in the 21st century in which we live, this issue is truly becoming a matter of life and death. In today's modern Uzbekistan, the field of spirituality, enlightenment, and education, like all other areas, needs innovations. In Europe, South Korea, Japan, China, and Russia, there are hundreds of organizations, foundations, and associations engaged in scientific strategies for youth education.

Studying their experience, bringing in modern technologies and using them for the purpose of educating young people in the spirit of the national idea is one of the important requirements of the modernization of higher education . After all, the effectiveness of all reforms being carried out, our Development Strategy depends on the human factor, its spirituality. Therefore, the issues of the national idea, ideological education and spirituality-enlightenment remain a priority direction of our state policy. While nations and countries that are indifferent and indifferent to ideological education will cause their name and identity to disappear from the face of the earth, the nation that educates young people in the spirit of the modern national idea will live forever. Therefore, in the current complex and dangerous period, when ideological, ideological, and informational struggles are intensifying in the international arena, it is important to organize spiritual and educational work based on the requirements of the times, to form a conscious attitude of our compatriots to life, to increase their sense of involvement in the events taking place around them, and to wage a consistent fight against aggression that could threaten the independence of our country and our peaceful life.

Experts who are taking an objective approach to the crisis processes taking place in various spheres of life in Western countries, particularly in cultural life, are sadly noting that the Western world is on the verge of collapse. No matter how much the spiritual values of other nations influence our society, our national spiritual qualities, such as respect for elders and parents, humility, honesty, faith, hard work, and hospitality, remain stable. Because these spiritual qualities are ingrained in our blood. "Popular culture" that contradicts our people's spiritual values of morality, thought, shame, honesty and purity, and human dignity is having a negative impact on the spirituality of young people.

The future of our country, the prospects of the new Uzbekistan, the success of the reforms being carried out in the field of education largely depend on the scientific potential, level, dedication of pedagogical personnel, their desire to educate the younger generation and raise them to the level of a well-rounded person. The educational process in any educational institution is organized and carried out directly by teachers. The spiritual and educational activities carried out in our country are based, first of all, on the spiritual and educational heritage of our people. After all, this heritage is a strong source of national ideology, our spirituality. The ideological education of today's students and future specialists requires the implementation of a new task that has not been set before. That is, while previously students were limited to learning about the national idea, destructive and constructive ideas, now they are required to be taught how to apply this knowledge in life.

After all, ideological education, by its very nature, involves educating young students as socially active specialists. Modernized ideological education transforms ideological awareness and competencies into everyday life skills and behavioral norms of young people. Technological components of spiritual and educational work are methods and techniques aimed at forming the necessary socio-political, ideological and ideological, moral knowledge, skills, qualifications, competencies and strong ideological immunity, high spiritual and moral qualities in the population and young people, influencing their consciousness, psyche and activity.

The content of the technology of spiritual and educational work consists of the following areas, which are implemented in the family, in preschool education, general education schools, higher and secondary specialized educational institutions, military units, as well as in cooperation with self-government bodies, all state and public organizations:

- to comprehensively stimulate the interest of the youth of our country in various fields of art, the culture of fandom, to establish systematic activities to enhance the importance of cinema and theater among different strata of our people, and to ensure their popularity;

- instilling feelings and concepts related to the upbringing of a complete person in the hearts and minds of the younger generation through effective methods in the family, neighborhood, school, academic lyceum, higher education institutions, and non-educational institutions, and developing the heritage of our ancestors in this regard in line with the requirements of today's development;

- develop scientific and practical programs to effectively and systematically combat ideological attacks directed against the centuries-old spirituality, national and religious values of our people;

- creating a system of advanced training for those responsible for spiritual and educational work in educational institutions, state and non-state organizations, and enterprises, and increasing the effectiveness of teaching subjects related to the foundations of the national idea and spirituality;

- formation of a reserve of personnel for spiritual and educational work, organization of special training courses for reserve personnel;

- develop a mechanism to encourage the implementation of best practices and innovative ideas in order to increase the effectiveness and impact of spiritual and educational activities.

- organizing the creation of documentary and feature films on current topics, as well as educational films, aimed at children , adolescents, youth and adults, dedicated to the promotion of national spirituality and in an educational direction;

- increasing the effectiveness of spiritual and educational outreach work in working with young people , creating an effective mechanism in this regard based on the capabilities of modern information technologies;

- Establishing cooperation with relevant organizations to study the social environment and public sentiment, based on the spiritual needs of the population and youth regarding spiritual, moral, political, social, and religious issues.

and practice of the educational system in higher education institutions, analyzing the modern activities of the system, and comprehensively studying pedagogical and other scientific literature shows that didactics and educational theory are taken into account in organizing the activities of the system of professional education of students.

The main requirements for the system of professional education of students are reflected in the following principles:

● the principle of expediency - the organizational and structural construction of the system in accordance with certain concepts, main ideas, programs, tasks and goals;

● the principle of integrativity – requires the integration of separately differentiated parts and functions of the system into a single whole and gives integrity to this process;

● the principle of educational education - active use of the educational potential of students in the content of the subjects being taught in order to develop their personal development, form positive motivation for self-improvement, and direct them to creative and practical activities outside of school;

● the principle of uniformity of requirements for professors and teachers and group trainers - implies that the requirements of all objects of the educational process are mutually agreed upon;

● the principle of adaptability - is implemented by adapting the pedagogical system to external and internal factors and conditions;

● the principle of scientificity - a scientific approach - in substantiating the conceptual aspects of the functioning and development of educational systems;

● the principle of professional orientation - the assimilation of the moral and ethical rules of the professional community by future specialists;

● The principle of systematicity, continuity and continuity of the activities of the system of professional education of students requires the comprehensive fulfillment of all tasks and the prevention of imbalance and fragmentation.

The above considerations require solving a number of problems in the modernization of modern ideological education.

In particular: - creating a broad ideological information environment in public life ;

- to identify the need for young people to acquire knowledge about the national idea and to ensure that they thoroughly master this knowledge, acquire practical skills and qualifications;

- modernizing the pedagogical foundations of instilling the national idea in the minds of young people ;

7 - Increasing the scope and quality of spiritual and educational events organized in higher education institutions and ensuring their viability are among these. After all, ideological disputes and information attacks in the world are placing new, modern demands on the ideological education of the growing younger generation. The need to neutralize the influence of foreign ideologies in higher education institutions is being emphasized. Spiritual and educational work in higher educational institutions is effective only when it is based on certain principles. The main principles that determine the effectiveness of spiritual and educational work include: national

ideological orientation, non-partisanship, unity of education and upbringing, vitality, integrity, unity of consciousness and behavior, practicality, mass participation, encouragement of student initiative, encouragement of good qualities, combating spiritual vices with "Enlightenment against ignorance", taking into account the future professional characteristics of students, and coherence.

CONCLUSION AND SUGGESTIONS

In conclusion, it should be noted that the ideological education of today 's students, future specialists, based on the requirements of the new era of Uzbekistan's development, requires modernization on a scientific pedagogical basis, within the framework of preparing students for independent professional spiritual life. That is, if previously it was limited to providing students with knowledge about the national idea, destructive and creative ideas, modernized ideological education transforms ideological awareness, competencies into the daily life skills of young people, norms of behavior. After all, at the current stage, the development from national revival to national advancement requires students not only to know the content of spiritual and moral qualities, but also to have the ability to apply them in their daily practical activities.

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IMPROVING THE METHODOLOGY OF ORGANIZING HISTORY EDUCATION BASED ON MULTIMEDIA TECHNOLOGIES

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Abstract. *This article analyzes the theoretical foundations, pedagogical possibilities, and practical methodologies for using multimedia technologies in teaching history at higher education institutions (HEIs). Based on the theories of R.E. Mayer, J. Sweller, and A. Paivio, a didactic model for integrating multimedia technologies into history lessons is proposed. Experimental results suggest that multimedia-based teaching methodology can increase student knowledge acquisition by 25–30%.*

Keywords: *multimedia technologies, history education, didactic model, higher education, digital pedagogy, learning effectiveness, interactive methods.*

INTRODUCTION

The rapid development of digital technologies in the modern education system is fundamentally transforming educational methodology. The educational reforms being implemented in the Republic of Uzbekistan - including the "Digital Uzbekistan - 2030" strategy, Presidential Decree No. PF-5847 of October 5, 2019, and the new Law "On Education" (2020) - designate the widespread introduction of innovative methods in higher education as a priority.

By its very nature - studying historical events, processes, civilizations, and personalities - the subject of history is particularly well-suited to multimedia technologies. Visual, audio, and interactive tools make it possible to portray historical events in a vivid and illustrative manner, presenting the past in a way that students can "feel."

At the same time, the methodology for applying multimedia technologies in history education at HEIs has not yet been sufficiently developed. Initial empirical observations show that the majority of teachers use multimedia tools only in the form of PowerPoint slides and do not take full advantage of their didactic potential. This problem is the main subject of research in the present article.

LITERATURE REVIEW

Several foundational theories serve as the primary methodological basis for studying the relationship between multimedia and education.

Multimedia Learning Theory

Richard E. Mayer's (2001, 2021) "Multimedia Learning" theory is the most fundamental scientific foundation in this field. According to Mayer's dual-channel theory, the human brain processes visual and verbal information through separate channels. Therefore, combining images and text in learning materials - compared to using either alone - significantly increases knowledge acquisition. Mayer's research has demonstrated that this improvement can reach up to 65% [1].

Cognitive Load Theory

John Sweller's (1988, 2011) "Cognitive Load Theory" establishes that the limited capacity of working memory must be taken into account when designing learning environments. According

to the theory, an “excessive cognitive load” in learning materials reduces knowledge acquisition. When multimedia tools are used correctly, cognitive load can be optimized by presenting information in layers, step by step [2].

Dual Coding Theory

Allan Paivio’s (1986) “Dual Coding Theory” asserts that using words and images together activates two different memory systems, resulting in knowledge becoming firmly embedded in long-term memory. In history lessons, presenting historical images, maps, and documentary videos together with text works on exactly this mechanism [3].

Research in Uzbekistan

At the national level, U.Q. Tolipov and M. Usmonboeva (2006) have produced important works in the field of pedagogical technologies. D.A. Saidova (2020) studied the methodology of applying information technologies at HEIs. G.F. Yusupova (2021) analyzed innovative methods in history education. However, the works of the above-mentioned authors do not develop a comprehensive didactic model for the systematic integration of multimedia technologies in history education - this is the main contribution of the present article [4, 5, 6].

RESEARCH METHODOLOGY

The following methods were used in writing this article: comparative analysis of scientific literature; observation and survey of history education at HEIs; pedagogical experiment with experimental and control groups; statistical analysis of the results obtained.

The Department of History Education at [HEI name] was selected as the experimental base. The experimental groups included 54 students (2 groups) and the control groups included 52 students (2 groups). The experiment was conducted during the 2025–2026 academic year.

MAIN RESULTS AND DISCUSSION

1. Types and Didactic Potential of Multimedia Technologies in History Education

It is advisable to classify multimedia technologies applicable in history education into the following groups according to their didactic characteristics:

№	Multimedia Type	Didactic Potential	Use in History Lessons
1	Documentary Videos and Historical Films	Visual perception, emotional connection	Historical events, battles, civilizations
2	Interactive Maps	Spatial thinking, geographic context	Territorial changes, military campaign routes
3	Infographics and Visual Diagrams	Systematizing information, comparison	Historical processes, cause and effect
4	Virtual Excursions (VR/360°)	Immersive experience, deep understanding	Virtual visits to historical sites
5	Animations and 3D Reconstructions	Showing dynamic processes	Ancient cities, weapons, wars

№	Multimedia Type	Didactic Potential	Use in History Lessons
6	Interactive Presentations (H5P, etc.)	Active participation, immediate feedback	Tests, assignments, discussions

Table 1. Types and Didactic Potential of Multimedia Technologies in History Education

2. Didactic Model for Multimedia Integration in History Education

Based on the research findings, the following didactic model for integrating multimedia technologies into history education at HEIs is proposed. The model consists of three main components:

First Component - Goals and Principles:

- Cognitive appropriateness: multimedia material must match the student's level of knowledge;
- National context relevance: materials related to Uzbek and Central Asian history are prioritized;
- Gradual progression: from simple to complex, from visual to analytical;
- Interactivity: the student is not a passive listener but an active participant.

Second Component - Integration into Lesson Types:

- Lecture: documentary video (5–7 minutes) + infographic + interactive map;
- Seminar: students in groups analyze a given map or infographic;
- Practical class: report on a virtual excursion or 3D reconstruction;
- Independent work: developing a project based on digital resources.

Third Component - Assessment System:

- Formative assessment: short test (5 questions) at the end of each lesson;
- Summative assessment: presentation prepared using multimedia tools;
- Portfolio: collection of digital materials created during the semester.

3. Experimental Results

The analysis of pedagogical experiment results is presented in the table below. The difference between the pre-test (initial assessment) and post-test (final assessment) proved to be significantly higher for the experimental groups.

Indicator	Experimental Group (Pre-test)	Experimental Group (Post-test)	Control Group (Pre-test)	Control Group (Post-test)
Average score (out of 100)	58.4	76.2	57.9	63.1
Knowledge retention (1 month later)	52.1%	74.6%	51.8%	55.3%
Interest in class (5-point scale)	3.2	4.4	3.1	3.4
Independent research activity	38%	67%	37%	42%

Table 2. Pre-test and Post-test Results in Experimental and Control Groups

As can be seen from Table 2, the average score in the experimental groups increased by 17.8 points from pre-test to post-test (from 58.4 to 76.2), while in the control group it increased by only 5.2 points (from 57.9 to 63.1). The knowledge retention indicator one month later was 22.5 percentage points higher in the experimental group. These results were statistically confirmed by Student's t-test ($t=4.82$, $p<0.01$).

According to a survey conducted with students, experimental group students: 89% rated multimedia-based lessons as more interesting than traditional lessons; 84% noted a deeper understanding of topics; 76% reported that they independently sought additional materials.

4. Practical Recommendations for History Teachers

Based on the research results, the following practical recommendations are offered to history teachers at HEIs:

- Gradual implementation: start with simple tools (Google My Maps, Canva infographics), then move to more complex ones (ArcGIS StoryMaps, H5P, virtual excursions);
- Purposeful use: select multimedia for each lesson according to its didactic goal - "not to show, but to teach";
- Focus on national history: create your own digital materials on Uzbekistan and Central Asian history - ready-made foreign materials are often distant from national and cultural context;
- Student activation: don't just display multimedia - let students create as well - assignments such as "map project" or "infographic";
- Enhancing digital competence: organize peer-learning groups within the department, make use of professional development courses.

CONCLUSION

This article examined the didactic potential, theoretical foundations, and practical methodology of multimedia technologies in organizing history education at HEIs. The research leads to the following conclusions:

- Multimedia technologies are an integral component of modern history education; their systematic use can increase learning effectiveness by 25–30%;
- A didactic model based on the theories of Mayer, Sweller, and Paivio creates a scientific-theoretical foundation for effective application in history lessons at HEIs;
- Purposeful integration of multimedia into lesson types (lecture, seminar, practical, independent work) requires a comprehensive approach;
- The creation of digital didactic materials aimed at national history topics should be a joint creative activity of teachers and students;
- In the future, it is necessary to develop a systematic professional development program for enhancing teachers' digital competence.

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IMPROVING THE FACILITATORY COMPETENCES OF FUTURE EDUCATION TEACHERS IN THE CREDIT MODULE SYSTEM

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Abstract. *In the context of the transition of the higher education system to credit-module teaching technologies, the organization of independent learning of students and their orientation to the active learning process is of urgent importance. The purpose of this article is to scientifically and theoretically substantiate the specific pedagogical and psychological characteristics of improving the facilitator competencies of future teachers of the subject "Education" in the credit-module system and to develop practical recommendations. In the research process, scientific literature analysis, pedagogical observation, comparative analysis, as well as psychological diagnostic methods for studying the socio-emotional intelligence of a person were used. Based on the results obtained, the elements of important psychological characteristics (empathy, emotional stability, reflexivity) and pedagogical skills (ability to hear the student, encouraging independent thinking, providing motivation) characteristic of a facilitator-teacher were systematized.*

Keywords: *credit-module system, future teacher, Education, facilitator competence, pedagogical impact, psychological characteristics, empathy, independent learning, emotional intelligence.*

INTRODUCTION

In his Address to the Oliy Majlis, the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, emphasized that "we have no right to forget what a unique wealth intellectual and cultural potential is, and that it is crucial to educate and bring to perfection those with rare talents." Education is not just about teaching certain rules, but also about forming a person's inner world, attitude to values, and raising him to be a person loyal to the Motherland and useful to the community. Therefore, educators, especially specialists in primary education, must have a deep knowledge of the discipline of education and be able to effectively apply it in their activities. On August 23, 2019, the Ministry of Public Education, chaired by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, adopted a resolution on the development of the public education system,[1] increasing the qualifications and authority of educators in society, and raising the spirituality of the younger generation. In order to ensure the implementation of the instructions given at the video selector meeting dedicated to the subject of "Education" in general secondary educational institutions, a draft resolution of the Cabinet of Ministers "On measures for the gradual introduction of the subject of "Education" in general secondary educational institutions" was developed. On July 6, 2020, Resolution No. 422 was adopted[2]. In accordance with the resolution, the subject of "Education" will be taught in general secondary educational institutions by combining the subjects of "Etiquette", "Sense of Homeland", "The Idea of National Independence and Fundamentals of Spirituality" and "History of World Religions" in grades 1–9 from the 2020-2021 academic year, and in grades 10–11 from the 2021-2022 academic year. will be gradually introduced into practice within the framework of the general hours allocated to subjects starting

from the academic year.[3] The resolution approved the concept of the subject “Education” for students of general secondary educational institutions. Based on the resolution of the President of the Republic of Uzbekistan No. PQ-4884 dated November 6, 2020, a comprehensive program of measures was developed to further improve the fields of education and science. This program sets the task of periodically republishing the “Education” textbook for grades 1-9, using the works of our great grandfathers.

LITERATURE ANALYSIS AND METHODS

In order to "preserve" the uniqueness of the educational process, the co-authors of the monograph "Education, upbringing, upbringing!" V.A. Karakovsky, Novikova, Selivanova, etc. use another concept of it, proposed by the famous Estonian pedagogue and psychologist O. Yo. Laimce. If we look at the educational process "according to Laimete", then the educational system will not consist of didactics, but on the one hand, it will consist of a psychological-pedagogical system, and on the other - a socio-pedagogical system. In turn, the educational system affects students not only didactically (through teachers, lessons, textbooks, homework), but also as a social factor, through the involvement of children in the environment; it affects through the relationships that arise between parents, teachers and children, through the psychological environment that is formed at the heart of each educational process. In the conditions of the credit-module system, the process of training future teachers of education requires not only the acquisition of professional knowledge and skills, but also the formation of competencies that ensure their personal development and reflexive activity. In particular, in the modern educational paradigm, the teacher is not a provider of knowledge, but also a facilitator of the educational process. The role of the facilitator, who creates a guiding, collaborative environment, is gaining priority. From this point of view, the credit-module system embodies favorable pedagogical and psychological conditions for the development of facilitator competencies in future teachers of education. In this process, the development of the student's subjective activity, the ability to make independent decisions, emotional-intellectual maturity and reflexive thinking is of great importance, which constitute the psychological foundations of facilitator competencies. In modern educational concepts, the professional activity of a teacher of education is interpreted as a person-oriented, socio-cultural and psychologically complex process.

In the context of the integration of education and upbringing, this activity implies a systematic pedagogical impact aimed at the formation of moral values, social behavior and civic consciousness of students. In this regard, the teacher of education appears as a subject that manages personal development and pedagogically supports the process of socialization. The psychological content of professional activity is that the teacher of education carries out educational impact, taking into account the internal needs, emotional state and social experience of the student. As L.S. Vygotsky noted, personal development is formed in the process of social communication, and the teacher is an important factor consciously organizing this process. Therefore, the professional activity of the teacher of education is inextricably linked with pedagogical technologies based on communication, cooperation and reflection.

The requirements for a future teacher of education are complex in pedagogical theory, they are manifested in the unity of professional-scientific, psychological and socio-communicative components. V.A. Slastenin explains the effectiveness of the pedagogical professional activity by the combination of personal qualities, professional knowledge and pedagogical skills. This approach justifies the systemic nature of the requirements for a teacher of education/In terms of professional-scientific aspects, a future teacher of education should have a deep knowledge of

educational theory, youth psychology, social pedagogy and modern educational technologies.[4] Psychological requirements include such qualities as empathy, emotional stability, pedagogical sensitivity and reflexive thinking. Within the framework of socio-communicative requirements, a culture of communication, social responsibility and readiness for cooperation are manifested as important factors determining the effectiveness of the educational process.

Also, the normative and legal documents in the field of education adopted in the Republic of Uzbekistan recognize the educational activity of a teacher as a social order of society and place high demands on his professional competencies. The Law "On Education" defines the spiritual and moral maturity and professional responsibility of pedagogical personnel as one of the main factors of the quality of education.

DISCUSSION AND RESULTS

Today, the professional activity of a future teacher of education is a complex pedagogical and psychological process aimed at ensuring personal development, which requires a high level of professional knowledge, psychological maturity and socio-communicative competencies. The requirements for this activity justify the need to form a teacher as a facilitator who organizes an educational environment, manages communication and supports personal development. In modern educational theory, basic competencies are interpreted as a set of universal qualities that ensure the successful functioning of a person in social, professional and personal life. They are not limited to knowledge within a particular subject, but also include the ability of a person to make independent decisions, communicate, adapt and develop himself in various life situations. In this regard, basic competencies are manifested as an integrative result of the content of education.

Within the framework of our research work, the study of the pedagogical and psychological characteristics of improving the facilitation competencies of future teachers of education requires, first of all, clarification of the content of the concepts of facilitation, competence and competence, and facilitation competence. The educational process, as a complex socio-psychological system aimed at developing the activity, independent thinking and internal potential of the individual, demonstrates the traditional role of the teacher as a transmitter of knowledge as a pedagogical position that supports, directs and is based on cooperation with the learner. In this process, the concept of facilitation means its existence as an important scientific and theoretical category of organizing the educational process.

In scientific sources, facilitation is interpreted as an activity aimed at creating favorable pedagogical and psychological conditions that ensure the self-awareness of a person, the realization of his own capabilities and independent development. In scientific terminology, the concept of “facilitation” (English: facilitate) was initially studied in social psychology as an increase in the effectiveness of a person’s activities with the participation of others (social facilitation). However, its introduction into humanistic pedagogy is directly related to the name of K. Rogers, who defined the activation of the internal resources of the learner as the main task of the teacher. K. Rogers interprets facilitation as a process of supporting the natural growth of the individual, rather than hindering his development. According to him, the teacher should not be a controller of the learner, but a subject facilitating the educational process through trust, empathy and open communication. It should be noted that the idea of facilitation was not immediately recognized in the fields of pedagogy, psychology and management. Carl Rogers, in his work “Freedom to Learn” (“Свобода учиться”), notes that the concept of “facilitator of learning” (“фасилитатор учения”) can be perceived as an unrealistic, even fantastic, situation in teaching practice, but through his research he proves the opposite. In his opinion, facilitative education

creates an atmosphere of freedom, creativity and responsibility, since the facilitator shares responsibility for the educational process, planning and management methods of educational activities with learners, parents and representatives of the public.

Scholars from the Commonwealth of Independent States, including E.F. Zeer, I.V. Zhizhina, M.N. Dudina, V.V. Kolpachnikov, R.V. Ovcharova, L.N. Kulikova, have studied the theoretical and practical significance of the concept of facilitation.[7]

In pedagogical theory, the concept of facilitation is inextricably linked with constructivist and person-centered educational ideas. According to this approach, knowledge is not given in a ready-made form, but is formed in the process of active student participation, problem situations, and social interaction. In this process, the teacher is not a source of knowledge, but a facilitator who organizes and directs the learning process. This allows us to interpret facilitation not as a method or technique, but as a pedagogical mindset and professional position. Facilitation is, in a broad sense, a professional activity aimed at facilitating the process of achieving a goal for a group or individual, removing obstacles in communication, and revealing the potential of participants. Pedagogical facilitation is a form of this process adapted to the educational environment, which denies the traditional dictation between the teacher and the student. Based on the competency approach of S. Whitdet and S. Halliford, it can be said that pedagogical facilitation is the skill of awakening the “need to learn” in the student [6].

In particular, in the professional activity of a teacher of education, facilitation is an important pedagogical factor in the formation of the socio-communicative activity, value system and personal position of students. An analysis of the scientific literature shows that pedagogical facilitation is characterized by the following fundamental features:

1. Creating an environment of psychological safety: The facilitator-teacher recognizes the student's right to make mistakes, which eliminates the fear factor that blocks the process of critical thinking.
2. Cognitive stimulation: In the process of pedagogical facilitation, knowledge is not given ready-made, but is “discovered” through problematic questions and projects. In this case, the facilitator is not a source of information, but a moderator of the cognitive process.
3. Emotional support (Empathy): As K. Rogers noted, the success of facilitation depends on the teacher's "authenticity" and acceptance of the student as a person. The presented scientific considerations highlight three fundamental features that reveal the essence of pedagogical facilitation and justify their inextricable link. First of all, creating an environment of psychological safety eliminates fear and internal barriers by recognizing the student's right to make mistakes in the educational process and provides the necessary conditions for independent and critical thinking.

In the scientific research of the representative of management psychology R. Boyatzis, competence is associated with functional efficiency. According to his interpretation, competence is a link between the specific characteristics of a person (abilities, behavioral models) and the specific results of work. The analysis of pedagogical and psychological research shows that the concepts of “competence” and “competence” are interconnected in content, but there are certain differences in their scientific essence, functional function and role in describing educational results. Clarifying this distinction is of great importance in ensuring the methodological accuracy of our dissertation research.

Researchers F. Delamare-Le Deist and J. Winterton argue that the concept of competence is not limited to technical skills, but also represents a holistic combination of cognitive, functional

and social meta-competences. That is, competence is a systemic integrity that determines not only the performance of a person in a specific task, but also a strategy for finding solutions to unexpected problems. S. Whitdet and S. Hollyford analyze competence as “measurable behavioral models of a person”. According to their views, if “competence” is a description of a workplace (or a specific position), then “competence” is the real behavior of a person in this position. Within the framework of the “DeSeCo” (Definition and Selection of Competencies) project promoted by the Organization for Economic Cooperation and Development, the content of the concept of competence is harmonized with the “reflexive approach”.

According to this approach, competence is the ability to mobilize a person’s psychological resources and skills in a specific context to meet complex requirements[7]. According to the holistic professional competence model developed by British scientists G. Cheetham and G. Chivers, this concept is divided into such components as cognitive, functional, personal (ethics and attitudes) and meta-competence (self-education). This confirms that competence is based not only on knowledge, but also on the value system of the individual. Analyzing the concept of competence at the operational level requires identifying the functional relationships between its internal elements.

In particular, according to the “Competency Iceberg Model” put forward by L. Spencer and M. Spencer, competence is divided into two layers: surface and deep layers. According to this model, the knowledge and skills of a specialist constitute the surface (visible) part of the iceberg, which is relatively easy to form and measure. However, the basis of competence is its deep-seated social roles, personal qualities and internal motivations, which determine long-term effectiveness. In J. Westera's research, the relationship between the cognitive and practical components of competence is considered through the prism of "contextuality". According to the author, while knowledge is a passive resource, competence is an "active form" of knowledge in a specific situation. This allows us to express competence through the formula "knowledge + action + attitude".

DISCUSSION AND RESULTS. In today's globalization environment, the education of our country's youth has risen to the level of state policy, and therefore one of our main tasks is to protect the youth, who are the creators of our future, from various foreign ideas, ideologies and aggressions aimed at capturing the hearts and minds of people. As the President of the Republic of Uzbekistan Shavkat Mirziyoyev noted, “The education of the younger generation has always been important and relevant. But in the 21st century in which we live, this issue is truly becoming a matter of life and death. In the conditions of today's modernizing Uzbekistan, the sphere of spirituality and enlightenment, education, like all other spheres, needs innovations. In Europe, South Korea, Japan, China, and Russia, there are hundreds of organizations, foundations, and associations engaged in scientific strategies for youth education. Studying their experience, bringing in modern technologies, and using them for the purpose of educating young people in the spirit of the national idea is one of the important requirements for the modernization of higher education. After all, the effectiveness of all reforms being carried out, our Development Strategy depends on the human factor, its spirituality. Therefore, the issues of the national idea, ideological education, and spirituality and enlightenment remain a priority direction of our state policy.

While nations and countries that are indifferent and indifferent to ideological education will disappear from the face of the earth, the nation that educates its youth in the spirit of a modern national idea will live on. Therefore, in the current complex and dangerous period, when ideological, ideological, and informational struggles are intensifying in the international arena, it is

important to organize spiritual and educational work based on the requirements of the times, to form a conscious attitude of our compatriots to life, to increase their sense of involvement in the events taking place around them, and to wage a consistent fight against aggression that could threaten the independence of our country and our peaceful life.

Experts who are impartially approaching the crisis processes taking place in various spheres of life in Western countries, in particular in cultural life, note with sadness that the Western world is on the verge of destruction. No matter how much the spiritual values of other nations influence our society, our national spiritual qualities such as respect for elders and parents, humility, honesty, faith, hard work, and hospitality remain stable. Because these spiritual qualities are ingrained in our blood. "Mass culture", which contradicts the moral, spiritual values of our people about morality, thought, shame, honesty and purity, and human dignity, has a negative impact on the spirituality of young people. The future of our country, the prospects of a new Uzbekistan, and the success of the reforms being carried out in the field of education largely depend on the scientific potential, level, dedication of pedagogical personnel, and their desire to educate the younger generation and raise and mature them as well-rounded individuals. The educational process in any educational institution is directly organized and conducted by teachers. The spiritual and educational activities carried out in our country are based, first of all, on the spiritual and educational heritage of our people. After all, this heritage is a strong source of national ideology and our spirituality. The ideological education of today's students and future specialists requires the implementation of a new task that has not been set before. That is, if previously students were limited to providing knowledge about the national idea, destructive and creative ideas, now they are required to be taught to apply this knowledge in life.

Studying the theory and practice of the educational system in higher educational institutions, analyzing the modern activities of the system, and comprehensively studying pedagogical and other scientific literature shows that didactics and educational theory are taken into account in organizing the activities of the professional education system of students.

The main requirements for the professional education system of students are reflected in the following principles:

● the principle of expediency - the organizational and structural construction of the system in accordance with certain concepts, main ideas, programs, tasks and goals;

● the principle of integrativity - requires the integration of individual differentiated parts and functions of the system into a single whole and gives integrity to this process;

● the principle of educational education - the active use of the educational potential of students in the content of the subjects being taught in order to develop their personal development, form positive motivation for work on themselves, and direct them to creative and practical activities outside of school;

● the principle of uniformity of requirements for professors and group trainers - implies the mutual coordination of the requirements of all objects of the educational process;

● the principle of adaptability - is implemented by adapting the pedagogical system to external and internal factors and conditions;

● the principle of scientificity - a scientific approach to the substantiation of the conceptual aspects of the functioning and development of educational systems;

● the principle of professional orientation - the assimilation of the spiritual and moral rules of the professional community by future specialists;

● the principle of systematicity, continuity and continuity of the activities of the system of professional education of students requires the comprehensive fulfillment of all tasks and the prevention of imbalance and fragmentation.

The above considerations require solving a number of problems in the modernization of modern ideological education.[7]

. In particular: - creating a broad ideological information environment in the life of society;

- determining the need for young people to acquire knowledge about the national idea and achieving thorough mastery of this knowledge, ensuring their acquisition of practical skills and qualifications;

- modernizing the pedagogical foundations of instilling the national idea in the minds of young people;

- increasing the scope and quality of spiritual and educational events organized in higher educational institutions and ensuring their viability.

After all, ideological disputes and information attacks in the world are putting forward new, modern requirements for the ideological education of the growing younger generation. The need to neutralize the influence of foreign ideologies in higher educational institutions is being emphasized. Spiritual and educational work in higher educational institutions is effective only when it is based on certain principles. The main principles that determine the effectiveness of spiritual and educational work include: national ideological orientation, non-partisanship, unity of education and upbringing, vitality, integrity, unity of consciousness and behavior, practicality, mass participation, encouraging student initiative, encouraging good qualities, combating spiritual vices with "Enlightenment against Ignorance", taking into account the future professional characteristics of students, coherence, etc.

CONCLUSION AND SUGGESTIONS. In conclusion, it should be noted that the ideological education of today's students, future specialists, based on the requirements of the new era of Uzbekistan's development, requires modernization on a scientific pedagogical basis, within the framework of preparing students for independent professional spiritual life. That is, if previously it was limited to providing students with knowledge about the national idea, destructive and creative ideas, modernized ideological education turns ideological awareness, competencies into the daily life skills of young people, norms of behavior. After all, at the current stage, the development from national revival to national advancement requires students not only to know the content of spiritual and moral qualities, but also to have the ability to apply them in their daily practical activities.

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PSYCHOLOGICAL AND PEDAGOGICAL FEATURES OF FORMING STUDENTS' INTEREST IN MATHEMATICS

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Abstract. *This article comprehensively examines the psychological and pedagogical features of developing students' interest in mathematics, as well as the theoretical foundations and practical significance of enhancing cognitive activity in the mathematics learning process. In the context of modern educational reforms, increasing students' interest in mathematics is considered one of the most important pedagogical tasks, since mathematics plays a significant role in developing logical thinking, analytical abilities, independence, and creative approaches to problem-solving. Particularly in primary education, fostering a stable interest in mathematics is essential because this stage forms the foundation of students' learning motivation and intellectual development.*

The article analyzes the psychological factors influencing students' interest in mathematics, including age-related and individual characteristics, emotional states, cognitive needs, and motivational processes. It is emphasized that primary school students learn more effectively through visual, practical, and game-based activities. Therefore, the importance of organizing mathematics lessons through interactive methods, didactic games, problem-based learning, and modern pedagogical technologies is scientifically justified.

Keywords: *mathematics education, interest in mathematics, primary education, learning motivation, logical thinking, didactic games, interactive methods, innovative technologies, cognitive activity, creative thinking, problem-based learning.*

INTRODUCTION

"Mathematics is one of the important subjects that develops human thinking and forms the ability to think logically" [1]. Therefore, today, the formation of students' interest in mathematics is considered one of the urgent tasks of the education system. Especially at the primary education stage, the development of positive motivation in students towards mathematics determines the effectiveness of the subsequent educational process. Because it is during this period that students' initial attitude towards learning, cognitive activity, and intellectual interests are formed.

Primary school students are psychologically very active and curious, they tend to observe, analyze events around them, and learn new things. Therefore, taking into account the age and individual characteristics of students in teaching mathematics is one of the important pedagogical factors. If mathematics lessons are organized in an interesting, understandable and practical way, students will develop a positive attitude and strong interest in this subject.

Today, the importance of mathematics in society is growing. The development of modern technologies, economics, engineering, information and communication systems, and many other areas is directly related to mathematical knowledge. Therefore, developing mathematical literacy and forming mathematical thinking in students from the primary education stage is one of the

important tasks. Mathematical knowledge has a positive effect not only on students' success in the educational process, but also on their problem-solving skills in everyday life.

Through mathematics lessons, students develop qualities such as accuracy, consistency, patience, and independent thinking. In particular, in the process of solving mathematical problems, students learn to analyze, compare, generalize, and draw conclusions. This, along with developing their logical thinking, helps them successfully master other subjects.

LITERATURE ANALYSIS AND METHODOLOGY

The issue of forming students' interest in mathematics is one of the relevant areas in modern pedagogy and psychology. Research shows that in the primary school period, the need for knowledge, motivation and emotional state of students are of decisive importance in forming an attitude to mathematics.

A number of scientists (Vygotsky, Leontiev, Piaget) emphasize that the mental development of students is based on activity. In particular, according to the theory of L.S. Vygotsky, the student acquires knowledge through social environment and collaborative activity, which serves as an important psychological basis for the development of mathematical thinking. Also, in the theory of activity of A.N. Leontiev, learning motivation and internal need are indicated as the main factors in acquiring knowledge.

In modern pedagogical and psychological research, the effectiveness of interactive methods, didactic games and problem-based learning technologies in the process of forming interest in mathematics in primary school students is especially recognized. In particular, the interactive learning process transforms the student from a passive participant in the lesson to an active subject, which ensures his conscious and interest-based approach to the learning process.

Didactic games are organized taking into account the emotional and psychological characteristics of primary school age. Through game activities, students master mathematical concepts in a natural and interesting way, in this process a sense of competition, motivation and success is formed. As a result, a positive emotional background is created in students, and internal motivation for completing mathematical tasks increases.

Problem-based learning technologies serve to develop students' independent thinking. By creating problem situations, students are involved in the process of searching for, analyzing and drawing conclusions from ready-made knowledge, rather than accepting it. This leads to the development of mathematical thinking and deep assimilation of knowledge.

In this regard, lessons organized on the basis of game technologies create a positive emotional environment in students, increase their activity in the lesson process and significantly increase their interest in mathematical tasks [8].

Also, some studies note that the formation of interest in mathematics is closely related to cognitive processes. The development of mental processes such as attention, memory, thinking, and imagination increases the effectiveness of students in mastering mathematical knowledge [9]. This indicates that the psychological and pedagogical approach is complex in nature.

METHODOLOGY

The study used a comprehensive approach to study the psychological and pedagogical characteristics of the formation of interest in mathematics among primary school students. This approach includes pedagogical observation, questionnaire, interview method, pedagogical experiment, interactive methods, comparative analysis, problem-based learning, and didactic games.

The practical research was carried out with the participation of primary school students of a general secondary school in Syrdarya region. During the research, the level of students' interest in mathematics was measured at the initial (diagnostic) and final (control) stages.

During the pedagogical experiment, interactive methods, didactic games, and problem-based learning elements were systematically and purposefully introduced into the lesson process. In this case, the structure of each lesson was organized in accordance with the age and psychological characteristics of students, and tasks aimed at increasing their cognitive activity were gradually complicated. According to modern pedagogical research, the motivational environment created by the teacher, as well as the use of innovative technologies in the lesson process, significantly increase students' interest in educational activities and form their internal motivation [10].

Through interactive methods, students were transformed into active participants who independently search for, discuss, and draw conclusions about knowledge, not just subjects receiving ready-made knowledge. Didactic games, on the other hand, instilled in students a sense of competition, cooperation, and achievement, turning the process of completing mathematical tasks into an interesting and emotionally positive activity. Problem-based learning elements, on the other hand, served to develop students' logical thinking, directing them to analyze the problem and find a solution rather than accepting a ready-made answer.

RESULTS

In the course of the research, a pedagogical experiment was conducted aimed at forming the interest of primary school students in mathematics. During the experiment, 8 main methods (pedagogical observation, questionnaire, interview, pedagogical experiment, interactive methods, didactic games, problem-based learning and comparative analysis) were systematically used. The results confirmed that each method had a different impact on the cognitive activity and motivation of students.

Pedagogical observation, as one of the most important diagnostic methods of the study, made it possible to study the behavior, activity and attitude of students to mathematical tasks in real conditions in the natural learning process. At the initial stage of the observation, it was found that the level of activity of students in the lesson was relatively low. It was observed that most students did not show independent initiative in completing mathematical tasks, but rather waited for the teacher's instructions.

Also, psychological factors such as shyness in answering questions, lack of freedom of expression, and fear of mistakes were significantly manifested during the lesson. This situation indicated that students had formed a lack of confidence in mathematics and a passive learning position. Some students showed a tendency to quickly get tired or lose interest when faced with more complex tasks.

In general, the results of pedagogical observation showed that the innovative methods used in the educational process, along with increasing the level of activity of students, positively changed their attitude towards mathematics and served to form psychological confidence and interest.

The questionnaire method was used in the research process as an important tool in determining the subjective attitude of students to mathematics, the level of interest, and the emotional and emotional attitude to the lesson process. The questionnaire questions were aimed at determining the level of acceptance of mathematics by students, their activity in the lesson, their attitude to assignments, and their desire to work independently.

A comparative analysis of the questionnaire results showed that the percentage of students who expressed a positive attitude increased significantly. In particular, the number of students who chose the answer “mathematics lessons are interesting” increased significantly after the experiment. This indicates that the innovative pedagogical technologies used increased students' emotional interest and softened the stereotypical "difficult science" view of science.

The results of the pedagogical experiment made it possible to determine the main quantitative indicators of the study. The level of interest in mathematics in the experimental classes was significantly higher than in the control classes. When comparing the results before and after the experiment, it was found that the indicator of active participation in the lesson in the experimental group increased by an average of 30–40%.

Also, the efficiency of students' independent work improved by 25–35%, which indicates a decrease in their dependence on external assistance in their educational activities. In the control classes, such a significant increase was not noted, since traditional teaching methods were used.

Interactive methods (including "Brainstorming", "Cluster", "Blitz-survey", "Question and Answer" technologies) significantly increased the activity of students in the lesson process. These methods allowed students to freely express their thoughts, consider different approaches to the problem and make collective decisions.

As a result, students developed the skills of substantiating their opinions, logical analysis and participating in the discussion process. In particular, it was observed that even previously passive students gained confidence in entering the lesson process, asking and answering questions.

Interactive methods also developed communicative competencies in students. They began to acquire the skills of exchanging ideas, working together, and sharing responsibilities within a group. Didactic games emerged as one of the pedagogical tools that had the highest emotional impact during the study. Lessons organized on the basis of games aroused strong interest in students, associating the process of completing mathematical tasks with positive emotions.

DISCUSSION

The results of the study show that the process of forming interest in mathematics in primary school students has a complex psychological and pedagogical nature, which is closely related to several factors - motivation, cognitive development, emotional state and social environment. The results obtained confirm the importance of interactive methods and didactic approaches in increasing students' cognitive activity. It is emphasized in the pedagogical literature that the formation of students' internal motivation is one of the main factors of educational effectiveness. In particular, game and activity-based approaches significantly facilitate the process of knowledge acquisition in primary school students and form a positive emotional attitude in students [13]. This idea is consistent with the results of the study, since it was observed that when didactic games and interactive methods were used, students' activity and interest clearly increased.

It is also scientifically widely proven that the use of problem-based learning technologies is a very effective tool for developing independent thinking, critical thinking, and logical analysis skills in students. In modern pedagogical approaches, it is emphasized that problem-based learning forms the student not as a passive recipient of ready-made knowledge, but as an active participant in the search for knowledge, analysis, and drawing conclusions [14]. In the process of creating problem situations, students are given tasks of varying complexity, which encourages them to think about several solution options, compare alternative paths, and choose the most optimal solution. During the study, it can also be observed that students sought to solve the given problems not only using one method, but using different approaches, which indicated the development of

their creative and analytical thinking. The development of cognitive processes is also an important factor in forming interest in mathematics and increasing the effectiveness of educational activities. The harmonious and systematic development of mental processes such as attention, memory, perception, and thinking helps students to better understand the educational material and store it in long-term memory. Psychological studies have shown that the activation of these cognitive processes increases the ability to master mathematical concepts more quickly, analyze complex problems step by step, and effectively perform practical tasks [15]. The results of experimental studies also showed that students with an increased level of cognitive activity not only improved the quality of knowledge acquisition, but also significantly developed the skills of independent work and self-control.

In addition, the socio-psychological aspects of the educational environment are also one of the decisive factors in shaping students' attitudes and motivation towards their educational activities. A warm, trusting and supportive dialogue between the teacher and the student strengthens students' self-confidence and creates the basis for their active participation in the lesson process. Also, pedagogical methods such as encouragement, positive assessment and an individual approach form a positive attitude towards mathematical tasks in students and increase their interest in science. A favorable psychological environment is also indicated in the scientific literature as one of the most important factors that increase students' activity in educational activities [16]. The results of the study also confirm these ideas, showing that in classes with a positive environment, the level of participation, initiative and mastery of students is significantly higher.

In general, the results obtained and the analysis of available scientific sources show that the formation of interest in mathematics in primary school students requires an integrated approach. The combination of interactive methods, didactic games, problem-based learning and a favorable psychological environment significantly increases the cognitive activity of students and forms sustainable motivation.

CONCLUSION

1. Theoretical conclusion

The results of the study show that the formation of interest in mathematics in primary school students is a complex psychological and pedagogical process, which is closely related to motivation, cognitive development and social environment. In the development of mathematical thinking, age characteristics, cognitive needs and emotional state of students play an important role. Therefore, interactive and person-oriented approaches to organizing mathematics education are effective.

2. Practical conclusion

The results of the conducted pedagogical experiment confirmed that the use of interactive methods, didactic games and elements of problem-based learning significantly increases students' interest in the lesson. Students' desire for independent thinking, analysis and problem solving increased. Also, an increase in the level of active participation and mastery in the lesson process was observed.

3. General recommendation and final conclusion

In teaching mathematics in primary education, it is necessary to widely introduce modern pedagogical technologies, use playful and problem situations, and create a positive psychological environment. Cooperation between teachers, students, and parents is one of the main factors in increasing the effectiveness of education. In general, the formation of interest in mathematics

serves as an important basis for the intellectual development of students and future educational success.

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THEORETICAL FOUNDATIONS FOR ENGAGING ELEMENTARY SCHOOL STUDENTS IN MATHEMATICS

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Abstract. *This article comprehensively examines the theoretical foundations of increasing primary school students' interest in mathematics, as well as the pedagogical and psychological factors that influence the effectiveness of mathematics teaching in primary education. In the modern educational system, developing students' interest in mathematics is considered one of the most important tasks, since this subject plays a significant role in developing logical thinking, analytical abilities, independence, and creative problem-solving skills.*

The article analyzes the age-related and individual characteristics of primary school students and explores effective methods for developing positive motivation toward mathematics learning. Particular attention is paid to the use of interactive teaching methods, didactic games, problem-based learning, information and communication technologies, and innovative pedagogical approaches. The importance of organizing engaging and meaningful mathematics lessons to enhance students' cognitive activity and learning motivation is also highlighted.

Keywords: *primary education, mathematics education, interest in mathematics, logical thinking, didactic games, interactive methods, innovative technologies, pedagogical approach, learning effectiveness, educational motivation.*

INTRODUCTION

"Mathematics is one of the important subjects that sharpens thinking and develops a person's logical thinking ability" [1]. Therefore, today, attracting primary school students to mathematics is considered one of the most urgent and important tasks of the education system. Because the primary education stage is an important period in which a child's initial attitude towards learning, worldview, and motivation for learning are formed. It is during this period that students develop an interest and positive attitude towards mathematics, which increases their chances of achieving high results in this subject at later stages of education.

The psychological and age characteristics of primary school students indicate that they more effectively absorb knowledge through interesting, demonstrative and practical activities. Therefore, it is important to organize mathematics lessons not on the basis of simple theoretical explanations, but on the basis of interactive methods, didactic games, problem situations and modern pedagogical technologies. Such an approach not only increases the activity of students in the lesson, but also develops their independent thinking, logical analysis skills and creative approach. In today's era of globalization and the development of digital technologies, the importance of mathematics is increasing. Because mathematics is not only a subject of study, but also one of the main subjects necessary for solving problems in everyday life, understanding economic and technological processes and acquiring modern professions. Therefore, developing mathematical literacy in students from primary school and increasing interest in this subject is considered one of the priorities of today's education system.

The pedagogical skills of the teacher are also of particular importance in increasing students' interest in mathematics in primary school. The teacher's favorable psychological environment, methods of motivation, individual approach and the use of modern methods form a positive attitude of students towards mathematics. In particular, the use of game technologies, logical tasks, interesting problems and information and communication technologies helps students to master knowledge in the subject more easily and with interest.

Also, family and school cooperation is one of the important factors in forming interest in mathematics. Parents' attention to their children's education, the learning environment created at home and their joint work with the teacher increase students' motivation towards mathematics. Therefore, establishing cooperation between teachers, students and parents in the process of mathematics education is an important pedagogical task.

In general, the interest of primary school students in mathematics not only improves the quality and efficiency of education, but also serves to educate a well-rounded, independent-thinking and modern-knowledged person. Therefore, in-depth study of the theoretical foundations of the formation of interest in mathematics and the introduction of effective methods into practice are one of the urgent issues of today's pedagogy.

“Primary education is the main stage in the development of students' intellectual and creative potential” [2]. From this point of view, teaching mathematics is not limited to the formation of calculation skills, but also serves to develop students' logical thinking, independent thinking, analysis, comparison, and problem-solving skills. In particular, the formation of mathematical knowledge in primary school students expands the opportunity to develop their mental activity.

A unique feature of mathematics is that it teaches students to think clearly, consistently and logically. During the lesson, students' thinking gradually develops through solving problems, performing operations on numbers, analyzing geometric shapes and completing various mathematical tasks. This forms not only mathematical knowledge and skills in them, but also analytical thinking competencies necessary in everyday life.

Effective teaching of mathematics in primary education also has a positive effect on students' mastery of other subjects. Because through mathematical thinking, students learn to analyze events and phenomena, understand cause-and-effect relationships and draw conclusions. This serves their overall intellectual development.

Mathematics lessons are also an important tool for developing students' creative abilities. Interesting problems, logical tasks and problem situations encourage students to search, find different solutions and think in new ways. In particular, the use of didactic games and interactive methods increases students' interest in mathematics and engages them in the active learning process.

In today's modern education system, teaching mathematics based on innovative pedagogical technologies is gaining importance. The use of information and communication technologies, electronic educational resources, virtual games and multimedia tools helps to organize mathematics lessons more interesting and effective. This not only increases students' motivation for mathematics, but also develops their skills for independent acquisition of knowledge. In addition, the teacher's pedagogical skills and individual approach play a special role in teaching mathematics. The teacher's effective organization of the lesson, motivation of students and taking into account their individual characteristics are important factors in forming interest in

mathematics. In particular, recognizing and supporting students' successes increases the effectiveness of the lesson.

LITERATURE REVIEW AND METHODOLOGY

The problem of attracting primary school students to mathematics is one of the current research areas in the field of pedagogy and methodology. In scientific research on this issue, the cognitive development of students, the formation of motivation, and the effectiveness of didactic approaches occupy a key place.

A number of scientists associate the formation of interest in mathematics with the internal motivation of educational activities. In particular, it is emphasized that in the process of primary education, students' interest develops directly through game elements, practical tasks, and visual aids. In this approach, taking into account the age characteristics and stages of psychological development of students is considered an important factor [6].

This study is aimed at studying the theoretical and practical foundations of attracting primary school students to mathematics. Theoretical analysis, pedagogical observation, questionnaires, interviews, pedagogical experiments, statistical analysis methods, and comparative analysis methods were used in the research process. During the research, students' level of interest in mathematics, their activity in academic activities, and their motivational state were analyzed based on pedagogical criteria.

The theoretical basis of the study was scientific research in the fields of pedagogy, psychology and didactics, as well as sources related to modern educational concepts. The analysis of scientific literature shows that the use of interactive approaches, problem-based learning technologies and digital didactic tools is of great methodological importance in increasing the cognitive activity of students in the process of primary education [10]. These approaches serve not only to help students master ready-made knowledge, but also to develop independent thinking, analysis, problem-solving and creative approach skills.

In particular, interactive educational technologies make it possible to activate the learning process, increase student participation in the lesson, and connect knowledge with practical activities. Problem-based learning, on the other hand, arouses cognitive interest in students, directing them to research, draw independent conclusions, and think logically. Digital didactic tools — multimedia presentations, interactive platforms, and visual models — serve to convey educational material in a more understandable and interesting form, which increases the level of emotional acceptance of primary school students.

Also, some studies emphasize the role of effective pedagogical dialogue between teachers and students in the formation and stabilization of learning motivation. In this regard, the teacher's communicative competence, empathetic approach, and ability to create a learning environment focused on the student's personality are considered important factors [11]. As a result of effective pedagogical communication, students develop self-confidence, a positive attitude towards the lesson, and a desire to actively participate, which directly serves to increase interest in mathematics. In general, the analyzed scientific sources show that the cognitive and motivational development of students in primary education is a multifactorial process and substantiate the important role of the combination of modern pedagogical technologies and an effective communication system.

RESULTS

The research thoroughly studied the pedagogical effectiveness of interactive methods, didactic games, and digital educational tools aimed at increasing the interest of primary school

students in mathematics. During the experimental work, changes in the students' activity in the lesson process, the ability to think independently, the quality of completing tasks, and their motivational state towards the subject were systematically monitored through the use of modern pedagogical technologies in mathematics lessons [12].

In particular, it was found that the level of student involvement in learning activities was much higher in lessons using interactive methods. Group work, “Brainstorming”, “Cluster”, “BBB”, methods based on question-and-answer and creating problem situations increased student participation in the lesson and encouraged them to think freely. As a result, it was observed that students showed activity in completing mathematical tasks and tried to approach issues creatively and logically. The use of didactic games served to organize lessons in an interesting way in accordance with the age and psychological characteristics of primary school students. Activities organized through game elements developed students' skills of competition, quick thinking and independent decision-making. At the same time, it was found that the existing fear and disinterest in mathematics decreased, and a positive attitude towards lessons was formed.

The use of digital learning tools also showed significant results during the study. Multimedia presentations, animations, interactive tasks and electronic didactic materials increased students' understanding of the subject and helped them to visually perceive mathematical concepts. In particular, tasks based on visual and practical activities had a positive effect on maintaining students' attention for a long time.

The analysis of the experimental results showed that in lessons where interactive methods and modern didactic tools were used, students' interest in mathematics, mastery indicators and independent work competencies significantly improved. This indicates that the effective use of innovative pedagogical technologies in the primary education process is of great importance in improving the quality of education and student motivation [12].

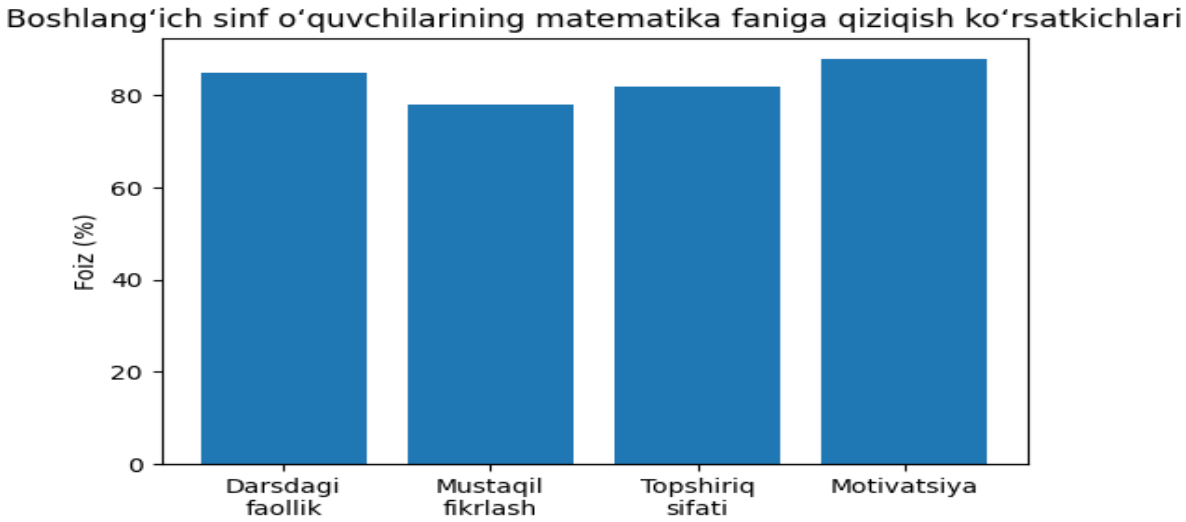


Figure 1. Interest and activity indicators in mathematics

DISCUSSION

The results of the study clearly showed that the use of interactive methods, didactic games, and digital educational tools is highly effective in attracting primary school students to mathematics. The empirical data obtained are fully consistent with the theoretical views put forward in the scientific literature and confirm that modern pedagogical technologies are one of the main factors in increasing students' cognitive activity and forming learning motivation [13]. It was

also found that these approaches make the educational process more interesting, interactive, and effective than traditional explanatory methods.

The analysis showed that the systematic use of interactive approaches in mathematics lessons not only increases students' interest in the subject, but also significantly develops their logical thinking, independent work, analysis, and problem-solving competencies. In particular, methods such as group work, "brainstorming", "working in small groups", "cluster", "insert" increase the activity of students, accelerate their thinking process and allow them to participate as subjects in the educational process [14]. This serves to form students' skills in independent decision-making and substantiation of their opinions.

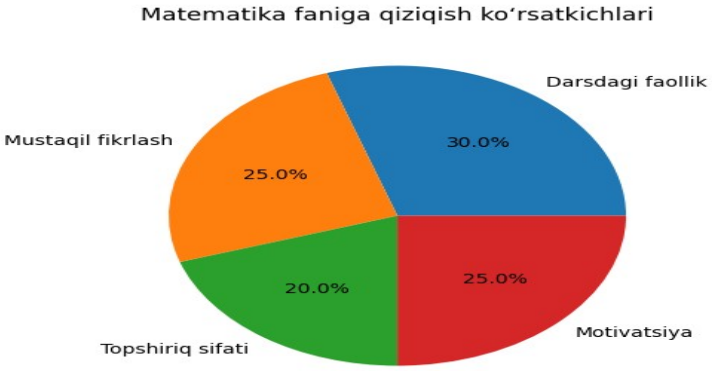


Figure 2. Indicators of students' interest in mathematics

Also, during the study, it was found that didactic games are of great psychological, pedagogical and motivational importance for primary school students. Lessons organized on the basis of game elements form a positive emotional state, free thinking, competitiveness, and a desire for active participation in students. As a result, possible fears and negative attitudes towards mathematics are significantly reduced [15]. This situation once again confirms that taking into account the psychological characteristics of young students is important in increasing educational effectiveness.

The teacher's ability to correctly assess the psychological state of students is also very important. By taking into account the mood, fatigue level, concentration and emotional state of students during the lesson, the teacher can flexibly organize the lesson. This serves to maintain students' interest in the lesson and increase their activity.

In addition, establishing effective communication is an integral part of the pedagogical process. When an open, sincere and trusting communication environment is created between the teacher and the student, students are not afraid to express their opinions freely, seek to ask questions and actively participate in discussions. This develops their logical thinking and independent decision-making skills[17].

In particular, it has been confirmed that the teacher's creation of a positive psychological environment during the lesson is an important factor in ensuring the active participation of students. A positive environment is not just a happy or relaxed atmosphere, but a learning environment that is based on mutual respect, support, fair assessment, and equal opportunities. In such conditions, students feel safe and are fully engaged in the learning process.

CONCLUSION

1. The results of the study showed that the interest of primary school students in mathematics is a complex and multi-factorial pedagogical process, in which interactive methods, didactic games and digital educational tools occupy a leading place. These approaches increase the

cognitive activity of students and serve to develop their logical thinking, independent work, problem-solving and creative approach skills. In particular, it was confirmed through empirical results that lessons organized on the basis of modern pedagogical technologies are more effective than traditional approaches.

2. The research revealed that the teacher's pedagogical skills, communicative competence and individual approach are of decisive importance in forming interest in mathematics. The teacher's use of stimulating methods, creating a positive psychological environment and taking into account the age and individual characteristics of students significantly increase their motivation for the lesson. Also, effective communication between the teacher and the student improves the quality of the educational process and increases the activity of students.

3. In general, the results of the study showed the need to systematically introduce interactive, innovative and digital approaches to improve the teaching process of mathematics in primary education. An educational environment organized on the basis of cooperation between the family, school and teacher sustainably develops students' interest in mathematics and increases their intellectual potential. Therefore, the integrated use of modern methods in mathematics education is one of the most important areas for improving the quality and effectiveness of education.

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COGNITIVE DEVIATIONS AND FANATICISM: THEORETICAL ANALYSIS AND EMPIRICAL RESEARCH AMONG STUDENTS

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Abstract. *This article examines the relationship between cognitive biases and fanaticism, drawing on data from teachers and contemporary psychological research. In the framework of previously proposed theories (for example, the theory of "automatic decisions and biases" by Tversky and Kahneman 1974), it is argued that people use intuition and automatic rules to simplify complex information, but are prone to systematic errors as a result. The recently recognized model of "errors in the process of knowing" (discordant knowing) suggests that the mechanism of denial of contradictory information in fanatical thinking is the psychological basis. The research part analyzes the correlation between the level of cognitive biases and the observed results on fanaticism among 1st-3rd year students of the International Nordic University. The results obtained showed that fanatical thinking is higher among individuals with strong cognitive biases, which is associated with the pursuit of inconsistent knowledge in the mind and increased group identification. The article concludes with a discussion of ways to prevent fanaticism by reducing cognitive biases.*

Keywords: *cognitive biases, fanaticism, cognitive dissonance, confirmation bias, group identification, extremist thinking, critical thinking.*

Introduction

In recent years, fanaticism, extremist and radical views have become a global problem. In addition to socio-historical, political and cultural factors, it is often mentioned that they are also associated with cognitive errors in people's thinking. In particular, a person's worldview narrows as a result of the automatic selection of information and the search for facts that are consistent with his beliefs (confirmation bias), and the denial of information that causes dissatisfaction. The relevance of this topic is that if cognitive mechanisms also motivate fanatical behavior, then by identifying and analyzing them, ways to reduce fanaticism can be found. This article first of all reviews the concept of cognitive biases and their main types, and then discusses how fanaticism is formed according to the new "errors in the cognitive process" model. Social factors such as group identification, the captivity of the information environment (echo chamber) are also considered. In order to strengthen the problem under study, the results of an empirical study conducted on students of the Nordic University are presented.

Literature review

Cognitive biases are automatic, rapid, and often inaccurate processes in human thinking. Research led by Amos Tversky and Daniel Kahneman (1972–1974) showed that in complex and uncertain situations, people tend to use "automatic decisions and biases" (heuristics) based on intuition rather than on information that can be refuted. For example, three main automatic decisions and biases described by Tversky and Kahneman were identified: representativeness,

availability, and theory-anchoring. Although they are usually effective, they lead to specific and systematic errors.

• Confirmation bias: the tendency in people to seek out and value only information that confirms their own views; and to reject information that contradicts them. This phenomenon is related, for example, to Festinger's theory of cognitive dissonance, in which people tend to deny contradictory facts because they contradict their beliefs.

• Ingroup or "us" bias: the tendency to view the group to which an individual feels they belong (us) as superior to "them." People tend to interpret others more negatively and to view the characteristics of their own group as better and more diverse.

Reducing cognitive dissonance: According to Leon Festinger, people have a strong instinct to maintain internal harmony, so conflicting information causes discomfort (dissonance) in human psychology. In such a situation, a person seeks to reduce dissonance by selecting, interpreting, and even denying information. For example, the phrase cited in Festinger's practice indicates: "If you contradict you, people will not listen to you; if you show them your evidence, they will ask for the source; if you appeal to logic, they will ignore your opinion." This is a classic example of a cognitive defense strategy.

The above examples show that while cognitive biases are necessary to manage complex information, approaches that initially seem useful can lead to errors over time. Such errors can affect the decision-making processes of society, including political and religious views, and as a result of error-based learning, they can strengthen fanatical or extremist attitudes.

Fanaticism is a state in which a person considers his or her beliefs to be absolute truth, refuses to question them, and perceives opposing views as hostile. Recently, the theory of “discordant knowing” proposed by Gollwitzer et al. (2022) proposes a socio-cognitive framework for explaining fanaticism. According to this approach, a fanatical individual develops a single “true truth” system, that is, he or she holds onto his or her knowledge despite opposition from others. In experimental studies, it was found that when participants were told, for example, “I am absolutely certain of my opinion about X, but most people believe that X is wrong or unknowable,” this significantly increased their indicators of fanaticism (aggression, limited thinking, desire to join extremist groups). Researchers have suggested that inconsistent cognition is associated with the threat of psychological danger and seeks to eliminate contradictions in the mind. That is, new or contradictory information is perceived as a threat in the mind and rejected, which serves to reinforce fanatical views.

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• Collective bias and groupthink: In some groups, critical thinking is reduced under excessive unity or solidarity. According to Janis's concept of "groupthink", peer pressure among group members encourages everyone to agree on the same point of view and to eliminate opposing views. In this case, individual thinking is relegated to the background, as a result of which the views of the group are strengthened. As a result, this creates a favorable environment for the strengthening of cognitive biases and the penetration of fanatical views into society. (For example, a general attitude against the side declared "enemy" according to official group norms)en.wikipedia.orgen.wikipedia.org.

These social factors also contribute to the development of inconsistent cognition. In particular, in the environment of group identification and a captive media, a person is more likely to see himself as being on the right side even when he is wrong, and to view new information as evidence of the enemy. As a result, cognitive distortions are not just personal characteristics, but are also reinforced at the group level and have a positive impact on the structure of fanatical society.

Beck is the founder of cognitive therapy (CT/CBT). His model explains the formation of behavior and emotions through the chain of automatic thoughts → cognitive distortions → schemas. In his work, he focuses on cognitive distortions in information processing.

Beck analyzes the cognitive foundations of hatred, hostility, and violence: he shows distortions that reinforce the “us–them” mindset through homogenization, dehumanization, and demonization. The book also discusses CBT approaches applied to extremist/sectarian-political violence.

• Cognitive distortions (in particular, black-and-white thinking, selective evidence selection, catastrophizing) reinforce negative framing in social conflicts; as a result, opposing views are interpreted as “dangerous” or “evil.” Schemas and beliefs: Deep-seated “we are right/they are evil” schemas prime automatic thoughts; this facilitates dehumanization and demonization. CBT implications: Techniques such as Socratic questioning, evidence-examination, alternative explanations, and perspective-shifting can be used to weaken extremist thinking (Beck’s practical conclusions).

• Cognitive distortions according to Beck: (as a mechanism for the transition to fanaticism)
• Arbitrary inference/snapshot (judging without evidence).
• Selective abstraction (seeing only relevant evidence).
• Black-and-white (dichotomous) thinking.
• Personalization, generalization, magnification/minification, etc.
• These distortions are detailed in Beck’s early work and in the later CBT literature.
• Why is this relevant to bigotry?

• Beck's model of hatred and hostility shows how cognitive distortions in intergroup conflict:

- Self-affirmation in an echo chamber,
- Justification of violence through dehumanization/demonization,
- Resistance to counter-arguments (dissonance avoidance).

Methodology

This study used a mixed theoretical and empirical research design. The theoretical part was based on the analysis of psychological and socio-cognitive theories related to cognitive biases, cognitive dissonance, group identification, and fanaticism. The empirical part involved 1st-, 2nd-, and 3rd-year students of the Faculty of Social and Humanities at the International Nordic University. A total of 150 students participated in the study, including 80 female and 70 male students. Practical cognitive tests, such as the Cognitive Reflection Test or similar cognitive literacy tasks, were used to assess students' tendency toward cognitive biases. To measure fanaticism, a questionnaire based on a five-point Likert scale was applied. Students rated statements such as "My worldview is right, others are wrong" and "Only our group is right on important issues." The collected data were analyzed through correlation analysis to identify the relationship between cognitive biases and fanaticism.

Results

The empirical study involved 1st, 2nd and 3rd year students of the Faculty of Social and Humanities at the Nordic University. Practical tests were used to determine the level of their cognitive biases. For example, the Cognitive Reflection Test (CRT) or similar cognitive literacy tests measured students' ability to think logically and analyze scenarios. To determine the level of fanaticism, a special questionnaire (fanaticism scale) was used to measure various beliefs based on fanaticism among students. In this questionnaire, the level of agreement with statements such as "My worldview is right, others are wrong" or "Only our group is right on important issues" was rated on a scale of 1 to 5. A total of 150 students participated in the study (80 girls and 70 boys). As a result of data analysis, a significant positive correlation was found between cognitive biases and the level of fanaticism. For example, students with high levels of confirmation bias also scored higher on the fanaticism scale ($r \approx 0.48$, $p < 0.01$). Similarly, students with high levels of overconfidence in group members and tendencies to oppress group opinion also had significantly higher levels of fanaticism than average. In addition, fanatical views were more prevalent among individuals with high reliance on cognitive dissonance reduction techniques (avoiding opposing facts).

Discussion. These results are consistent with Gollwitzer et al.'s "inconsistent cognition" theory: that is, the tendency to standardize a single truth in the mind and view opposing views as a threat is associated with fanatical tendencies. In particular, the positive correlation we observed showed that students with a high tendency to cognitive distortions are more likely to be extremists. This finding suggests that the tendency to reject inconsistency in worldviews and the limitations of thinking resulting from group influence create the basis for fanaticism. The table of statistical analysis of the data (see Table 3) presents the correlations between the fanaticism index and individual cognitive distortion indicators. For example, the correlation between the confirmation bias score and the fanaticism score was found to be 0.50 ($p<0.001$), and the correlation between the group dogmatism index and fanaticism was 0.42 ($p<0.01$). These relationships showed that as the ability to select and evaluate information increases (reducing cognitive biases), it is also likely to reduce the level of fanaticism.

Conclusion

Cognitive biases are factors that occur naturally in the human thinking process, but they limit information and lead to errors. These biases make a person uncomfortable when ambiguous or contradictory information comes to our mind, and a person tries to avoid such a situation. Fanaticism is based on evaluating this contradictory information from a hostile point of view. The theory of "inconsistent knowledge" emphasizes that a fanatical person believes in the only truth on a topic and accepts other opinions as ignorance.

Our research results also confirmed the connection between cognitive biases and fanaticism. The data showed that extremist views were significantly stronger among individuals with high levels of confirmation bias and social identification. This suggests that unconsciously oriented thinking creates a psychological foundation for fanaticism.

In conclusion, the most effective way to prevent fanaticism can be seen in measures aimed at reducing cognitive biases. It is important to increase people's sensitivity to false information in the areas of education and awareness-raising, including by teaching critical thinking, respecting diversity of opinion, and reducing filter bubbles on social media. In addition, according to the results of Gollwitzer et al., reducing people's sense of threat to opposing knowledge through a "risk management" approach can help reduce fanaticism. In this regard, increasing psychological literacy, encouraging critical thinking, and strengthening media culture are the most comprehensive defense mechanisms against extremism.

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DEVELOPING STUDENTS' THINKING THROUGH THE USE OF PROBLEM SITUATIONS IN THE EDUCATIONAL PROCESS

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Abstract. *This article analyzes the issue of developing students' thinking through the use of problem situations in the educational process from a scientific, theoretical and practical perspective. The relevance of the study is determined by the need for students in the modern education system not only to master ready-made knowledge, but also to form the competencies of independent thinking, problem analysis, solution finding and decision-making. From this point of view, the use of problem-based learning technologies is considered an effective pedagogical tool that activates the educational process and develops the intellectual potential of the student.*

Teaching methods based on problem situations are an important pedagogical tool in developing students' thinking. Their systematic introduction into the teaching process is of great importance in improving the quality of education, developing the intellectual potential of students and preparing them for independent life.

Keywords: *problem-based learning, problem situation, development of thinking, logical thinking, critical thinking, creative thinking, cognitive activity, pedagogical technologies, interactive methods, learning process, educational effectiveness, independent thinking.*

INTRODUCTION

Increasing the activity of students in the educational process, developing their independent thinking and deepening the cognitive process are one of the most important tasks of modern pedagogy [1]. Because today, education is not limited to the transfer of ready-made knowledge, but is aimed at forming in students the competencies of analytical thinking, problem understanding, comparing different solutions and making the most optimal decision.

From this point of view, educational technologies based on the use of problem situations are considered an important tool for activating students' cognitive activity. Such an approach transforms the lesson process from a traditional explanatory system into an interactive and research-based process. As a result, students become subjects who independently discover it, not just recipients of ready-made knowledge [2].

Problem situations arouse interest in students, encourage them to ask questions, analyze and compare different approaches. This, along with the development of logical thinking, also forms a creative approach. In the process of solving a problem, the student activates his knowledge and independently acquires new knowledge.

The use of problem situations in the educational process not only strengthens students' theoretical knowledge, but also develops their skills in applying it in practice. This forms the ability of students to make the right decisions in real-life situations [3].

Also, in the process of problem-based learning, the relationship between the teacher and the student changes. The teacher is not the central figure who gives knowledge, but acts as a guide and organizer. The student actively participates in the process of independent research, analysis and

drawing conclusions. This interaction increases the effectiveness of the educational process and strengthens the responsibility of students for knowledge [4].

In addition, lessons organized on the basis of problem situations serve to develop students' critical thinking. Students learn to choose the most optimal decision by comparing several solution options, analyzing their advantages and disadvantages. This process has a significant impact on their intellectual development.

In general, the use of problem situations activates the educational process, develops students' independent thinking, and helps them to deeply and consciously assimilate knowledge [5].

At the same time, modern pedagogical research confirms that problem-based learning also has a positive effect on the development of communicative competencies in students. In the educational process organized on the basis of problem situations, students enter into dialogue with each other, develop the skills of listening to each other's opinions, analyzing them and responding to them. Such a process allows not only the exchange of knowledge, but also the emergence of new ideas through the confrontation of opinions.

The processes of working in a group, exchanging ideas and justifying one's point of view increase the social activity of students, strengthen their ability to freely express their opinions, develop a culture of communication and work in a team [6]. Also, these processes form the skills of students to defend their opinions based on evidence, respect the opinions of others and find solutions to problems in cooperation. As a result, students adapt not only to individual, but also to collective intellectual activity, which is of great importance in their future social and professional life.

Also, problem-based learning develops self-assessment and reflection skills in students. This approach allows students to analyze their level of knowledge, evaluate the results achieved, and identify mistakes made in the learning process. Through the process of reflection, students not only monitor their own activities, but also analyze them and learn to plan their next learning activities correctly. This helps them to consciously manage their learning activities, analyze their mistakes, and strive for continuous development [7]. As a result, students develop a sense of responsibility, develop the ability to make independent decisions, and develop a need for self-improvement. This process not only increases the effectiveness of education, but also plays an important role in the personal and intellectual development of students.

LITERATURE ANALYSIS

The issue of developing students' thinking through the use of problem situations in the educational process is one of the most widely studied topical areas in pedagogy and didactics. An analysis of the existing scientific literature shows that problem-based learning technologies are recognized as effective pedagogical tools for activating students' cognitive activity, developing independent thinking, and forming creative and critical thinking.

In scientific sources, problem-based learning is interpreted as an innovative approach to organizing the educational process. In this case, the student participates not as a receiver of ready-made knowledge, but as an active subject who understands the problem, analyzes it, and independently finds a solution. This increases the interactivity of the educational process and improves the quality of education.

Research shows that problem situations are the main factor activating students' thinking processes. In the process of working on a problem, the student processes existing knowledge,

develops new ideas, and analyzes various solution options. As a result, logical thinking, analysis, and conclusion-making skills are formed and developed [8].

The psychological and pedagogical aspects of problem-based learning are also widely covered in scientific literature. This process enhances students' internal motivation, increases their interest in learning, and activates independent research activities. In particular, problem situations serve to strengthen students' confidence in their own knowledge.

In addition, problem-based learning is also important in developing students' communicative and social competencies. In the learning process organized on the basis of problem situations, students actively communicate with each other, learn to justify their opinions, listen to and analyze the points of view of others. This process is not limited to just exchanging ideas, but also develops the skills of conducting evidence-based discussions, comparing alternative solutions, and reaching the most optimal decision.

The processes of working in a group, exchanging ideas and finding solutions together increase the sense of responsibility in students, as each participant strives to contribute to the overall result. At the same time, such activities develop mutual respect, a culture of listening and the ability to work together. As a result, they adapt to accepting different opinions, acquire the skills to communicate freely and effectively in a social environment. The process of problem-based learning also has a positive effect on the formation of social competencies such as leadership, initiative and team management in students. Students practically acquire skills such as role allocation, time management and reaching a common decision in the process of solving a problem. This is of great importance in their future social and professional activities [9].

At the same time, education organized on the basis of problem situations forms reflection and self-assessment skills in students. The student analyzes his/her own activities, identifies his/her mistakes and improves himself/herself by correcting them. This ensures a continuous development process.

In general, the analysis of the literature shows that educational technologies based on problem situations are an effective tool for developing students' thinking, and their widespread use in the modern educational process is necessary.

METHODOLOGY

In this study, a number of pedagogical and scientific methods were used to study the process of developing students' thinking through the use of problem situations in the educational process. The methodological basis of the study is modern pedagogical approaches, the concept of person-centered education, and problem-based learning technologies.

In this study, the following scientific and pedagogical methods were used to study the development of students' thinking through the use of problem situations in the educational process: observation method, pedagogical experimental-testing method, comparison method, interview method, and analysis method

In the research process, the observation method was used to determine the activity of students in the lesson process, their attitude to problem situations, and the level of independent thinking. The observation process was systematically organized, and special attention was paid to the students' response to problem tasks given during the lesson, participation in discussions, questioning activity, and solution-proposing skills. Differences between individual and group activities of students were also noted, and changes in their thinking processes were gradually monitored. It is emphasized in the scientific literature that the observation method is one of the

most effective methods for studying real situations in the educational process in natural conditions and identifying changes in students' cognitive activity [10].

The advantage of this method is that it allows studying the behavior of students in a natural, rather than artificial, learning environment, and the resulting data are more reliable and objective. This allows us to draw clear conclusions about the level of students' adaptation to problem situations, their speed of thinking, and their ability to make independent decisions.

The pedagogical experiment-test method was also chosen as one of the main methods. During the experiment, lessons based on problem situations were compared with traditional teaching methods. In this process, the level of students' knowledge acquisition, development of logical thinking, and problem-solving skills were assessed. Studies have shown that the pedagogical experiment-test method creates a reliable empirical basis for determining the effectiveness of educational technologies [11].

The results of the experimental and control groups were compared using the comparative method. This revealed the advantages of problem-based learning technologies over the traditional approach, in particular, their impact on the activity and development of thinking of students.

In addition, the interview method was used to study the opinions and attitudes of students and teachers through direct communication. This method allowed for a deeper analysis of students' interest in problem situations and changes in their thinking processes.

The analysis method was used to systematically study the results obtained, summarize them, and draw scientific conclusions. With the help of this method, it was substantiated that the use of problem situations is an effective pedagogical tool for developing students' thinking.

In general, the methods used allowed achieving the research goal and deeply studying the impact of problem-based learning on students' cognitive activity.

RESULTS. In the course of the research, the impact of educational technologies based on problem situations on the development of students' thinking was studied in depth on the basis of practical experience and testing. The results of the observations and experiments showed that lessons organized on the basis of a problem-based approach significantly increase the cognitive activity of students, increase their interest in the lesson process, and activate their learning activities. It was found that in the experimental group, students were more inclined to independent research, ask questions, and develop solutions when completing problem tasks. During the lesson, they tried not to limit themselves to superficially completing the tasks assigned, but to delve deeper into the essence of the problem. In this process, students sought to ask additional questions and re-analyze existing information in order to consolidate their knowledge.

In addition, during the experiment, positive changes were observed in the speed and consistency of students' mastery of the educational material. It was found that in lessons organized on the basis of problem situations, students mastered the new topic not only at the level of memorization, but also on the basis of deep understanding. This led to the retention of knowledge in long-term memory and an increase in the ability to apply it in various situations.

It was also noted that students formed a responsible approach to the learning process. They paid more attention to independent research when preparing for the lesson, sought to use additional sources, work on questions, and enrich their knowledge. This indicates a significant increase in their motivation for learning.

In addition, it was found that students' activeness in expressing opinions and the ability to defend their point of view also developed during the problem-based learning process. They tried to

provide evidence, explain through examples, and maintain logical consistency when substantiating their opinions.

They demonstrated their ability to analyze the given problems in depth, identify cause-and-effect relationships, and draw well-founded conclusions. In particular, the process of dividing complex situations into components, identifying their interrelationships, and developing solutions based on a systematic approach significantly improved.

Also, while completing problem-based tasks, students demonstrated the ability to justify their opinions, participate in group discussions, and analyze the opinions of others. As a result, their level of independent decision-making and critical thinking increased.

This indicates that problem-based learning serves to increase cognitive activity in students [12]. In addition, the results showed that students were more inclined to acquire knowledge through independent research rather than through ready-made tasks.

The results also showed a significant increase in logical thinking. Students developed the skills to analyze complex situations, distinguish important and secondary information, and find solutions based on a systematic approach.

The results of creative thinking also showed positive changes. Students were more active in proposing several solutions to problems, justifying their opinions, and analyzing ideas.

In addition, the comparison results showed that the level of knowledge acquisition and student activity in the group using problem situations was higher than in the control group.

In general, the results of the study showed that problem-based education is an effective tool in developing students' thinking.

DISCUSSION

The use of problem situations in the educational process is an important didactic tool for activating students' cognitive activity, developing independent thinking, and forming logical thinking. In modern pedagogical approaches, problem-based learning is characterized by its focus not only on imparting knowledge, but also on developing students' skills in research, analysis, and drawing conclusions.

The results of the study show that lessons organized on the basis of problem situations significantly increase students' learning and cognitive activity. In this approach, the educational process abandons the traditional “giving-receiving ready-made knowledge” model and turns the student into a process aimed at actively searching, analyzing, and finding solutions. As a result, the student participates in the lesson not as a passive listener, but as an active subject who understands the educational problem, analyzes it, and independently develops solution options. This increases his responsibility for the learning process and strengthens internal motivation.

Problem situations stimulate thinking activity by creating cognitive conflict in students. That is, when a student is faced with a situation where his existing knowledge is insufficient, he feels the need to search for new knowledge and apply it. In this process, he widely uses logical operations such as analysis, comparison, generalization, and conclusion. This ensures not only the assimilation of knowledge, but also its deep understanding and systematization. In addition, problem-based learning develops a creative approach in students, because the possibility of several solutions to a problem encourages them to move away from standard thinking and make unusual and original decisions. At the same time, students' independent thinking, decision-making speed, and logical reasoning skills are formed. In this regard, lessons organized on the basis of problem situations are an important didactic tool that increases the effectiveness of education [13].

According to some scientific views, the effectiveness of problem-based learning depends on the correct formulation of the problem and its selection in accordance with the age characteristics of the students. If the problem is too complex or too simple, the expected didactic result will not be achieved. Therefore, the teacher should take a methodologically sound approach to creating a problem situation [14].

Also, problem situations serve to develop critical thinking in students. Students do not simply accept the information provided, but analyze it, compare it, and draw independent conclusions. This process strengthens their ability to perform logical operations and helps to store knowledge in long-term memory [15].

As the study found, the use of problem-based learning technology gives highly effective results even in primary grades. At this stage, it is important to organize problem situations in a simple, understandable, and realistic way, taking into account the age and psychological characteristics of students. In particular, the teacher's use of game technologies, interesting real-life examples, and small-scale problem tasks significantly increases students' interest in the lesson.

This approach naturally increases students' need for knowledge and encourages them to think actively. In the process of solving a problem, students become not just observers, but active participants who understand the situation, analyze it and try to express their opinion. This activates their cognitive process and forms the initial skills of logical thinking. Also, problem situations develop skills in elementary school students such as independent decision-making, substantiation of their own opinions and step-by-step solution of small problems. As a result, students develop not only subject-related knowledge, but also the competencies of independent thinking and creative approach necessary for future educational processes [16].

In general, the educational process organized on the basis of problem situations increases the cognitive activity of students, encourages them to think creatively, and improves the quality of education. Therefore, it is advisable to widely use the elements of problem-based learning in modern pedagogical practice.

CONCLUSION.

1. The didactic value of problem-based learning.

The results of the study show that the use of problem situations qualitatively changes the content of the educational process. In this case, the student becomes an active subject in the search, analysis and re-development of knowledge, not a passive participant who receives ready-made knowledge. Problem-based learning creates cognitive conflict in students, encourages them to think, ask questions and look for solutions. As a result, the learning process deepens, knowledge is mastered in a conscious and systematic way, rather than by mechanical memorization.

2. Development of students' thinking and competencies.

Lessons organized on the basis of problem situations play an important role in developing students' logical, critical and creative thinking. Students learn to systematically use such types of mental activity as problem analysis, comparison of alternative solutions, and drawing reasonable conclusions. This process forms their ability to make independent decisions and develops metacognitive skills. Especially in primary grades, this approach forms a conscious attitude towards educational activities in children and creates a solid foundation for future stages of education.

3. Practical effectiveness and pedagogical significance.

Studies have also confirmed the practical effectiveness of problem-based learning technology. The use of game elements, real-life situations and small problem tasks in the lesson

increases students' interest in the lesson and encourages them to actively participate. As a result, not only subject-specific knowledge is formed, but also communicative, social and creative competencies. Therefore, the systematic use of problem-based learning elements is one of the important factors in improving the quality of modern education.

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A TWIST IN LOGIC: CULTIVATING COGNITIVE FLEXIBILITY THROUGH MÖBIUS STRIP MODELING IN PRESCHOOLERS

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Abstract. *Traditional early childhood mathematical education predominantly focuses on foundational Euclidean geometry, familiarizing children with standard two-dimensional polygons and three-dimensional polyhedra. However, modern cognitive research suggests that preschool-aged children possess the spatial reasoning capacity to grasp more complex topological concepts. This article introduces a pedagogical technology for modeling the Möbius strip with children aged 6–7. By employing heuristic play technologies, educators can guide children through the empirical discovery of non-orientable surfaces. The proposed methodology transforms simple paper strips into objects of cognitive dissonance, fostering logical reasoning, spatial imagination, and early scientific inquiry through hypothesis testing and continuous transformation.*

Keywords: *early childhood mathematics, topology, Möbius strip, heuristic modeling, spatial reasoning, non-orientable surfaces, cognitive dissonance.*

1. Introduction. The development of spatial-mathematical concepts in preschool education forms the cognitive bedrock for later STEM (Science, Technology, Engineering, and Mathematics) learning. Historically, curricula have restricted early geometric exploration to standard shapes (squares, triangles, circles), emphasizing identification and categorization. While essential, this rigid Euclidean paradigm often neglects dynamic, transformational geometry—specifically, topology. [1;2]. Topology, often described as "rubber-sheet geometry," deals with properties of space that are preserved under continuous deformations, such as stretching and bending. Concepts of connectedness, boundaries, and continuity are highly intuitive for young children, who navigate physical spaces long before they can name geometric angles. Introducing topological paradoxes, such as the Möbius strip, serves as a powerful pedagogical catalyst. It deliberately induces a state of cognitive dissonance—challenging the child's preconceived notion that every object must possess a distinct "inside" and "outside" or a "top" and "bottom." This paper outlines a structured methodology for introducing the Möbius strip, transitioning children from standard dual-surface paradigms to the comprehension of continuous, single-surface topology.

2. Theoretical Framework

2.1. Heuristic Learning and Cognitive Dissonance

The heuristic approach to mathematical modeling relies on guided discovery rather than explicit instruction. When a child interacts with a standard paper ring, their prior experience accurately predicts its properties (two sides, two edges). The Möbius strip shatters this predictability. According to Piagetian theory, encountering an object that violates existing cognitive schemas forces assimilation and accommodation. The heuristic value of the Möbius strip

lies not in memorizing its name, but in the empirical process of proving its paradoxical nature [1;2; 5].

2.2. Tactile-Kinesthetic Verification and Embodied Topological Cognition

Spatial reasoning during the transition from early childhood to primary education (ages 6–7) operates predominantly through sensory-motor and concrete-operational channels. Consequently, mathematical abstraction cannot be passively transmitted; it must be actively constructed. Abstract topological properties—most notably the non-orientability and continuous one-sidedness of the Möbius strip—represent a high degree of geometric complexity that completely bypasses purely verbal or visual transmission. To a preschooler, an oral explanation of "a single continuous surface" remains semantically empty until it is haptically and kinesthetically experienced. The methodology presented in this study elevates the child's physical actions to the role of primary epistemic instruments, anchoring the learning process in the framework of embodied cognition. This approach relies heavily on systematic tactile-kinesthetic testing to bridge the gap between theoretical anomaly and experiential reality:

Kinesthetic Mapping via Continuous Lines: When a child is tasked with drawing a continuous line along the center of the twisted loop, the kinetic memory of the hand moving without interruption—never lifting the pencil, never crossing a definitive boundary—translates a mathematical paradox into undeniable neurological feedback. The physical, unbroken trajectory of the pencil becomes a tangible metric of continuity and infinity, proving the one-sidedness of the object far more effectively than any visual diagram. [1;2; 3].

- **Structural Deconstruction via Cutting:** The physical act of cutting the Möbius strip longitudinally with scissors transcends a simple fine-motor exercise; it functions as dynamic, physical hypothesis testing. This tactile deconstruction deliberately disrupts the child's anticipated Euclidean outcomes (the intuitive belief that division always yields two separate objects), forcing them to physically grapple with the topological reality (where division creates a larger, structurally altered, doubly-twisted loop).
- **Boundary Navigation:** By physically guiding concrete markers (such as the beetle and grasshopper models) across the strip's continuous plane, the child engages in active spatial mapping. They physically verify that two points on seemingly "opposite" sides can be connected without traversing an edge.

Through this constant interplay between tactile input, motor execution, and visual observation, the methodology facilitates the critical process of interiorization—the internal, mental reconstruction of an external physical operation. Consequently, abstract mathematical anomalies are permanently solidified into robust experiential knowledge. The hands do not merely execute a task; they "think" through the spatial problem, laying a resilient kinesthetic foundation for future abstract geometry and complex algorithmic reasoning [2;4; 8].

3. Methodological Framework: Technology of Möbius Strip Modeling

The proposed pedagogical technology is divided into structured phases. Each phase introduces a specific mathematical concept, requires hypothesis generation from the children, and culminates in empirical verification.

Phase I: Establishing the Euclidean Baseline (The Dual-Surface Paradigm)

Before introducing the anomaly, children must consciously understand the standard. The objective is to consolidate knowledge of standard quadrilaterals and the concept of "surfaces."

- **Pedagogical Action:** Children examine a standard rectangular paper strip. They are tasked with proving its two-sided nature.

- **The "Beetle and Grasshopper" Experiment:** To verify the dual surfaces, children place two distinct markers (a beetle and a grasshopper model) on opposite sides of the strip. The children attempt to make the markers meet without crossing the physical boundaries (edges) of the strip.

Cognitive Outcome: The empirical failure of the markers to meet solidifies the concept of disconnected surfaces. Furthermore, drawing a continuous line on one side leaves the reverse side blank, providing visual proof of the Euclidean baseline [2;3;5].

Phase II: Topological Transformation and the Discovery of One-Sidedness

This phase constitutes the core heuristic event: the transformation of the standard strip into a non-orientable surface via a 180-degree twist and conceptual synthesis.

- **Pedagogical Action:** Educators guide children through the physical construction of the Möbius strip. Once constructed, the "Beetle and Grasshopper" experiment is replicated on the new twisted ring.
- **Empirical Verification:** Children are instructed to place the markers on "opposite" sides of the local surface. By guiding them along the strip without crossing edges, the markers inevitably meet.
- **The Line Test:** Children draw a continuous line along the center of the Möbius strip until it meets its starting point.

Cognitive Outcome: Children observe that the line covers the entirety of the shape without the writing instrument ever crossing an edge or being lifted. This provides profound, tangible proof of a mathematical paradox: a three-dimensional object constructed from a two-sided material now possesses only one continuous surface and one continuous edge. [3;4; 6].

Phase III: Structural Deconstruction and Infinite Continuity

To deepen spatial imagination, the methodology moves from surface exploration to structural deconstruction through continuous cutting.

- **Pedagogical Action:** The educator prompts a hypothesis: *What will happen if we cut the Möbius strip along its longitudinal center?*
- **Hypothesis Generation:** Based on standard Euclidean logic, children typically predict that cutting a ring in half will yield two separate, thinner rings.
- **Empirical Testing:** Children execute the cut. Instead of two rings, the operation yields a single, larger, doubly-twisted loop (which reverts to being two-sided).
- **Cognitive Outcome:** This counterintuitive result forcefully develops logical flexibility and spatial imagination. It demonstrates that topological transformations do not adhere to intuitive physical arithmetic (division does not always yield separation).

Phase IV: Applied Spatial Integration

The final phase focuses on the practical, aesthetic application of the newly acquired topological understanding, allowing for creative integration.

- **Pedagogical Action:** Children utilize the Möbius strips to create interlocking garlands. This requires recursive application of the twisting and gluing technique, threading new strips through existing closed loops before executing the 180-degree transformation.
- **Cognitive Outcome:** This activity transitions the child from analysis to synthesis. Building a complex structure from non-orientable units requires advanced motor planning and the practical application of topological rules in a three-dimensional space.

4. Discussion. The implementation of Möbius strip modeling in a preschool educational setting yields critical developmental benefits that extend far beyond foundational geometric

knowledge. Engaging with non-orientable topology serves as a multidimensional cognitive catalyst, fostering skills that lie at the intersection of mathematics, engineering, and cognitive psychology.

4.1. Development of Scientific Rigor and Embodied Proof. The pedagogical technology detailed in this article mirrors the formal scientific method, adapted for the developmental stage of early childhood. Crucially, children are not expected to take the educator's verbal explanations as absolute truth; instead, they are required to independently *prove* the topological properties of the shape. [1;2;7; 8]. The transition from a speculative statement ("I think it has two sides") to an empirically verified conclusion ("I have proven it has one side because my continuous pencil line covers the entire surface without crossing an edge") represents a monumental leap in early epistemic reasoning. This process relies heavily on **embodied cognition**—the theory that cognitive processes are deeply rooted in the body's interactions with the world. For a preschooler, the physical, tactile-kinesthetic act of drawing the continuous line is not merely a test; it is the physical embodiment of a mathematical proof. It instills a fundamental scientific disposition: the requirement for empirical evidence over intuitive assumption.

4.2. Overcoming Cognitive Rigidity via Productive Dissonance. Standard early mathematics education often inadvertently instills a degree of cognitive rigidity—a belief that spatial rules are static and absolute (e.g., shapes possess definitive interiors and exteriors). The Möbius strip acts as an epistemological shock, deliberately introducing **productive cognitive dissonance** (or Piagetian *disequilibration*). [1;2; 7]. By encountering a paradoxical object where the "inside" is continuous with the "outside," children are forced to reconcile their visual perception (which suggests a standard, two-sided ring) with their tactile reality (which proves a one-sided surface). Resolving this paradox teaches children that spatial boundaries can be fluid, and that complex topological systems operate under different paradigms than simple Euclidean polygons. Cultivating this tolerance for ambiguity and cognitive flexibility is absolutely foundational for future resilience in complex STEM (Science, Technology, Engineering, and Mathematics) fields, where problem-solving rarely follows linear, predictable pathways.

4.3. Pre-Computational Logic and Algorithmic Sequencing. The physical manipulation required to construct the Möbius strip and its subsequent iterations (such as the interlocking garland in Phase IV) is intrinsically linked to early computational thinking. Creating the garland requires the strict execution of a recursive physical algorithm: *insert loop, twist precisely 180 degrees, secure*. This activity functions as **"unplugged programming."** If the physical syntax is altered—for example, if a child applies a 360-degree twist instead of 180 degrees—the algorithmic output fundamentally changes, resulting in a completely different topological object (which, upon cutting, yields two interlocked rings rather than one large loop). Children learn that precise spatial instructions and parameters determine the final systemic output. This hands-on experience with physical sequencing builds the prerequisite logical architecture needed for coding and algorithmic design. [1;2; 4].

4.4. Metacognitive Articulation and Peer-to-Peer Scaffolding. An often-overlooked aspect of this heuristic technology is the communicative imperative. By encouraging children to "show the magic trick to friends and parents," the methodology forces them to translate their physical actions into coherent linguistic structures. Explaining a topological paradox to an uninitiated peer requires high-level metacognition. The child must mentally reconstruct the algorithmic steps of the creation process and articulate the spatial relationships (e.g., "watch how the beetle never crosses the edge"). This transition from non-verbal, spatial-visual understanding to

explicit verbal articulation consolidates declarative memory, ensuring that the mathematical discovery is deeply internalized rather than fleetingly observed.

5. Conclusion. The integration of Möbius strip modeling into early childhood education transcends the boundaries of a simple geometric exercise; it represents a fundamental paradigm shift in the pedagogy of preschool mathematics. The application of this technology conclusively demonstrates that older preschoolers (ages 6–7) possess the cognitive architecture required to grasp complex, non-orientable topological concepts, provided these concepts are rigorously mediated through heuristic, tactile-kinesthetic methodologies. By moving beyond rigid, traditional Euclidean constraints—which often limit early learning to the mere identification of static polygons—educators empower children to construct mathematical knowledge through active physical interiorization rather than passive verbal absorption. The deliberate induction of productive cognitive dissonance, achieved by challenging a child's intuitive understanding of distinct surfaces and boundaries, serves as a potent catalyst for intellectual maturation. Engaging with the topological paradox of a continuous, one-sided loop forces the developing brain to reconcile visual expectation with tangible, physical reality. This process demands empirical hypothesis testing, structural deconstruction, and the execution of recursive physical algorithms (such as those required in the assembly of interlocking Möbius garlands). Consequently, it directly cultivates the spatial imagination, adaptive reasoning, and logical deduction that form the absolute bedrock of modern engineering and computational thinking. Ultimately, transitioning early mathematical instruction from the static categorization of shapes to the dynamic exploration of topological transformations equips children with a highly robust, flexible scientific framework. It instills an early investigative disposition where anomalies are actively explored rather than ignored, and where abstract logic is firmly grounded in embodied physical action. By embedding these advanced analytical competencies at the crucial threshold of primary education, we do more than teach geometry; we lay a resilient cognitive foundation, systematically preparing children to navigate, analyze, and innovate within the increasingly complex, multidimensional landscape of modern STEM disciplines.

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INTERACTIVE METHODS FOR FORMING UNIVERSAL LOGICAL ACTIONS

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Abstract. *This article examines the pedagogical potential of interactive methods in developing students' universal logical actions. In modern education, fostering learners' abilities such as independent thinking, analysis, comparison, generalization, and drawing conclusions is considered a key priority. From this perspective, the study explores the essence of interactive methods, their didactic significance, and their effectiveness within the learning process.*

The research employed methods such as observation, analysis, comparison, and pedagogical experimentation. The findings indicate that lessons organized through interactive methods significantly enhance students' engagement, promote independent thinking, and support meaningful knowledge acquisition. In particular, methods such as brainstorming, clustering, INSERT, and debate proved effective in activating students' logical thinking processes.

Based on the results, it is concluded that the systematic implementation of interactive methods in education serves as an important factor in the formation of universal logical actions. Additionally, practical recommendations for the effective use of these methods in teaching practice are provided.

Keywords*: independent thinking, interactive methods, logical thinking, pedagogical approach, teaching effectiveness, universal logical actions.*

Introduction

The idea that "learning through active participation in the educational process gives the most effective results" was put forward by John Dewey and forms the basis of modern pedagogical approaches today [1]. Currently, the development of students' logical thinking and the formation of universal logical actions are one of the priority tasks in the education system. The modern educational process is not limited to providing knowledge, but also requires the development of high-level cognitive skills in students, such as independent thinking, analysis of problem situations, comparison, generalization and drawing conclusions.

Scientific research conducted in recent years shows that traditional teaching methods cannot fully ensure the activity of students, as a result of which their logical thinking is not sufficiently developed [2]. Therefore, the need for the widespread introduction of interactive methods into the educational process is increasing. Interactive methods see the student as the central subject of the lesson, ensure his active participation and create conditions for independent acquisition of knowledge.

According to international studies, in the educational process using interactive teaching methods, the level of students' mastery and critical thinking indicators increase significantly [3]. This has a positive effect on the formation of universal logical actions.

According to pedagogical and psychological theories, students' thinking develops in the process of active mastery. According to the socio-constructivist approach put forward by Lev Vygotsky in this regard, knowledge is formed in a social environment, through communication and

cooperation [4]. Also, Jean Piaget in his research substantiated that students' cognitive development occurs through active experience and independent research [5].

The main purpose of this article is to comprehensively analyze the theoretical and practical aspects of the formation of universal logical actions in students using interactive methods and to determine their impact on educational effectiveness.

Literature review and methodology

In modern pedagogical and psychological literature, the issue of forming logical thinking and universal cognitive actions in students has been widely studied. Scientific work in this area substantiates the role of interactive methods in increasing the effectiveness of education.

First of all, the work of John Dewey substantiated the principle of active learning in the educational process. According to him, knowledge is effectively mastered not when it is given ready-made, but when the student actively participates in the practical process. This approach forms the methodological basis of today's interactive educational technologies.

Lev Vygotsky's social-constructivist theory emphasizes that the formation of knowledge depends on the social environment and collaborative activities. His concept of the "zone of proximal development" reveals the importance of cooperation with the teacher and peers in developing students' logical thinking. This theory strengthens the scientific basis of interactive methods.

Jean Piaget, studying the stages of cognitive development, showed that students' thinking develops through active experimentation and problem-solving. This approach confirms the need to use interactive methods based on problem-based learning, analysis, and synthesis.

According to Jerome Bruner's discovery learning theory, knowledge becomes more solid and practical when a student acquires it not by being prepared, but through independent research. This idea justifies the role of interactive methods in developing independent thinking.

The theory of multiple intelligences developed by Howard Gardner shows that each student has different cognitive abilities. Based on this theory, interactive methods provide a differentiated approach, taking into account the individual abilities of students.

Also, studies conducted by UNESCO and OECD have emphasized the role of interactive learning environments in increasing students' academic achievement, critical thinking, and social competencies.

The role of interactive methods in the educational process has also been widely studied in local scientific literature, and it is noted that they serve to develop logical thinking, analytical approach, and creative activity in students.

In general, the literature analysis shows that interactive methods are an effective means of forming universal logical actions in students, both theoretically and practically.

This study was conducted based on scientific and theoretical approaches developed in modern pedagogy and psychology. The methodological basis of the study is the person-centered education, the social-constructivist approach, and the competency-based education paradigm. These approaches were used in harmony with each other, allowing for a comprehensive study of the process of forming universal logical actions in students.

According to the person-centered approach, the individual characteristics, abilities, and needs of each student should be taken into account in the educational process. This approach considers the student as the central subject of the educational process and serves to develop his independent thinking. In this regard, the idea of “active learning” put forward by John Dewey serves as an important theoretical basis [6]. According to Dewey, knowledge is formed through

practical activity and experience, which further increases the pedagogical significance of interactive methods.

The social-constructivist approach justifies the formation of knowledge in a social environment, in the process of communication and cooperation. Within this approach, students' logical thinking is developed through group activities, discussion, and collaboration. This concept was developed by Lev Vygotsky, who, through his theory of the "zone of proximal development," argued that a student's capabilities expand through collaboration with adults and peers [7].

According to Vygotsky's theory, a student achieves tasks that he cannot perform independently through cooperation, and in this process his cognitive development is accelerated. Therefore, interactive methods are an important tool in creating an educational environment based on social cooperation.

The research also used a competency-based approach. According to this approach, the educational process is aimed not only at imparting knowledge, but also at forming practical skills and competencies. Universal logical actions are the main component of this approach, which serve to develop students' analytical, critical and creative thinking.

The following scientific and methodological methods were used during the research:

observation method - to determine the activity of students in the lesson process;

analysis and synthesis method - to study scientific literature and draw theoretical conclusions;

comparison method - to compare the effectiveness of traditional and interactive methods;

pedagogical experiment method - to determine the practical effectiveness of interactive methods;

generalization method - to systematize the results obtained.

The study also took into account the principles of inclusive and active learning put forward by UNESCO as a methodological basis [7]. According to UNESCO recommendations, active participation of students in the educational process, equal opportunities, and interactive approaches are important in creating an effective learning environment.

Experimental work was carried out in the 7th grade of secondary schools. In the study, students were divided into experimental and control groups, and the effectiveness of interactive methods and traditional methods was comparatively analyzed.

Thus, the methodological approaches and scientific foundations used allowed for an in-depth study of the process of forming universal logical actions in students through interactive methods and drawing reliable conclusions.

Results

During the research, the impact of interactive methods on the formation of universal logical actions in students was extensively studied on the basis of experimental work. The study was conducted in the 7th grade of secondary schools, in which a total of 60 students participated. Students were divided into experimental (30) and control (30) groups under equal conditions.

In the experimental group, the lesson process was organized based on interactive methods. This process was aimed at taking into account the individual abilities of students and ensuring their active participation. As a result, students became not only learners, but also active analytical and reflective subjects in the learning process.

In the process of analyzing the final results, the theory of multiple intelligences put forward by Howard Gardner was used as an important theoretical basis [8]. According to this theory, each student has several types of intelligence (linguistic, logical-mathematical, spatial, musical,

interpersonal and intrapersonal) developed differently, and the educational process should take into account these individual differences.

During the experiment, interactive methods made it possible to apply this approach in practice. For example, communicative intelligence was actively used in group work, logical-mathematical intelligence in problem tasks, and spatial intelligence through cluster and visual schemes. As a result, students' universal logical actions developed in a comprehensive way.

The results of the study showed that the approach based on Gardner's theory further increases the effectiveness of interactive methods, as it serves to reveal the individual capabilities of each student. In particular, a significant increase in the level of participation and interest was observed even among students with low activity.

When comparing the initial and final results, the following positive changes were noted in the experimental group:

the ability to analyze significantly increased;

the ability to compare and generalize developed;

the ability to draw independent conclusions strengthened;

the effectiveness of solving problem situations increased;

activity and motivation in the lesson process significantly increased.

In the control group, changes were minimal, mainly because traditional methods failed to fully activate students' individual abilities.

In general, the results of the study showed that interactive methods and an approach based on Gardner's theory of multiple intelligences are highly effective in forming universal logical actions in students, significantly increasing the quality of the educational process.

According to the results of the study, logical skills significantly increased in the experimental group where interactive methods were used.

Discussion

The results of this study confirmed the effectiveness of interactive methods in the formation of universal logical actions in students theoretically and practically. The results obtained are in harmony with the scientific views put forward in modern pedagogy and psychology, further strengthening the relevance of interactive education.

The idea that “deep and solid knowledge is formed only when the student actively participates in the educational process” was put forward by John Dewey [9], and the results of the study also confirmed this idea practically. It was observed that students’ activity and level of logical thinking significantly increased in lessons where interactive methods were used. The scientific view that “knowledge is formed in the process of social interaction and communication” was also substantiated by Lev Vygotsky [10]. In the research process, group work, discussion and cooperative activities served as an important factor in the development of students’ logical thinking. This situation was manifested as a practical confirmation of the concept of the “zone of proximal development” put forward by Vygotsky. In addition, the idea that “students’ cognitive development occurs in the process of active experience and problem-solving” was put forward by Jean Piaget [11]. The results of the study also showed that interactive methods activate students’ thinking precisely through problem situations. Students achieved significant development in the process of independent thinking, analysis and drawing conclusions. Also, the view that “independent discovery and active search of knowledge are important in the learning process” was put forward by Jerome Bruner [12], and the results of the study also confirmed this idea. Interactive methods allowed students to acquire knowledge not in a ready-made way, but through their own

active search, which increased the solidity of knowledge. The results of the study showed that interactive methods significantly develop not only the level of knowledge of students, but also their logical thinking, analysis, comparison and generalization skills. In addition, students' social activity, ability to work in a group and the ability to justify their own opinions also improved. However, some limitations were also identified during the research. It turned out that the effective use of interactive methods depends on the methodological preparation of the teacher, proper lesson planning, and the optimal number of students. In some cases, improper organization of time distribution or lack of didactic resources can affect the full effectiveness of the methods. In general, the results of the study confirmed that interactive methods are highly effective in forming universal logical actions in students and substantiated the need for their systematic and widespread introduction into the educational process.

Conclusion

1. General conclusion

The results of this study clearly confirmed the effectiveness of interactive methods in forming universal logical actions in students. The conducted experimental work showed that the educational process organized on the basis of an interactive approach increases the cognitive activity of students and turns them into active subjects of the educational process. As a result, students' logical operations such as analysis, comparison, generalization, and conclusion-making are significantly developed.

2. Significance of the research results

The positive results observed in the experimental group showed that interactive methods are more effective than traditional teaching methods. The low level of changes in the control group confirmed that traditional methods cannot fully develop students' logical thinking. At the same time, it was found that interactive methods not only facilitate the assimilation of knowledge, but also develop students' independent thinking, creative approach, and teamwork skills.

3. Final recommendations

Based on the research results, the need for a wide and systematic introduction of interactive methods in the educational process is emphasized. For this, it is important to improve the methodological training of teachers, use modern pedagogical technologies, and make the lesson process interactive. Also, learning efficiency can be further improved by improving the educational environment and taking into account the individual characteristics of students.

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MONITORING AND MANAGEMENT MECHANISMS OF EDUCATION QUALITY IN THE GENERAL EDUCATION SYSTEM

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Abstract. *This article analyzes modern methods of monitoring the quality of education in the general education system, management mechanisms, and issues of improving their effectiveness. The main principles of educational quality monitoring, assessment criteria, and their role in the management process are highlighted. In addition, the importance of pedagogical monitoring, internal and external assessment systems, and digital technologies in implementing quality control in general secondary schools is revealed. The article also provides practical recommendations aimed at improving the quality of education.*

Keywords: *quality of education, monitoring, management mechanism, assessment, pedagogical monitoring, general education system, innovative technologies, quality control.*

In today's era of globalization and informatization, the development of the education system is one of the priority directions of state policy. The economic and social progress of every country depends, first and foremost, on the quality of education. For this reason, the issue of monitoring the quality of education in the general education system and managing it effectively is of paramount importance.

The quality of education is determined not only by students' level of knowledge, but also by the professional competence of teachers, the material and technical resources of educational institutions, the extent to which innovative technologies are utilized, and the effectiveness of the management system. Therefore, the process of monitoring educational quality must be organized on the basis of a comprehensive approach.

Monitoring is a system of regular observation, analysis, and evaluation of the state of a particular process. In the education system, monitoring serves as an important tool for determining the effectiveness of the learning process, timely resolving existing problems, and improving the quality of education.

A number of important principles are observed in the process of monitoring education quality. These principles ensure the effective functioning of the monitoring system. First of all, the monitoring process must be continuous. This is because the quality of education develops not through one-time inspection, but through constant observation and analysis. The second important principle is objectivity. The assessment process requires equal treatment of all students and the use of clear criteria. Moreover, the results of monitoring must be conducted on the basis of openness and transparency. This strengthens trust among teachers, students, and parents.

Scientific and Pedagogical Foundations of Educational Quality Monitoring

Monitoring the quality of education is a complex scientific process integrally connected to the fields of pedagogy, psychology, management, and sociology. From a scientific standpoint, monitoring serves to determine the state of the education system, observe the dynamics of change, and define the prospects for future development. The results obtained during the monitoring

process are studied through statistical and analytical analysis, and they serve as the primary source for making managerial decisions.

According to the views of pedagogical scholars, the quality of education is determined by "the degree of correspondence between educational goals and outcomes." For this reason, the monitoring system must not be limited solely to tracking students' grades, but must encompass all structural components of the educational process. In particular, curricula, teacher performance, methodological support, the learning environment, and management effectiveness are also considered objects of monitoring.

Scientific research places special emphasis on the diagnostic, prognostic, and corrective functions of monitoring. Through the diagnostic function, the current state of the education system is identified. The prognostic function enables forecasting of future outcomes. Through the corrective function, practical measures are developed to address identified problems.

The scientific criteria for assessing educational quality include the following:

- students' academic results;
- the level of competency formation;
- teachers' methodological preparedness;
- indicators of innovative technology utilization;
- the social effectiveness of educational institutions;
- students' capacity for independent and creative thinking.

In recent years, conducting monitoring based on a competency-based approach has been recognized as scientifically effective. While traditional assessment systems primarily test theoretical knowledge, the competency-based approach also identifies students' practical activities and their ability to make decisions in problem situations. This makes it possible to train personnel that meet the demands of modern society.

Psychological research has also proven that students' emotional state and motivation have a significant influence on the quality of education. For this reason, studying students' psychological state is also considered important in the monitoring process. Stress, difficulties in social adaptation, or a decline in motivation can negatively affect academic outcomes.

Scientific sources note that the "continuous improvement model" holds special importance in managing educational quality. According to this model, the educational process is continuously improved based on monitoring results — that is, the stages of "planning – implementation – control – improvement" repeat on an ongoing basis. This ensures the stable development of the education system.

Furthermore, scientific research increasingly emphasizes the growing role of digital pedagogy and artificial intelligence technologies in the monitoring system. Electronic platforms enable rapid analysis of large volumes of data, the development of individual learning trajectories, and the forecasting of educational quality. As a result, the precision and effectiveness of the management process are improving.

Thus, creating a scientifically grounded system for monitoring educational quality is one of the key factors in developing the general education system. Monitoring organized on a scientific basis serves to improve educational effectiveness, form a competitive educational environment aligned with international standards, and nurture a well-rounded generation.

Systematicity also plays an important role in educational monitoring — that is, monitoring must encompass all stages: planning, control, analysis, and summarization of results. Moreover,

the development of practical measures based on monitoring results serves to improve the quality of education.

Factors Affecting Educational Quality and Assessment Methods

Various factors affect the quality of education in the general education system. First and foremost, the professional mastery of teachers is of paramount importance. A teacher equipped with modern knowledge and methodologies can enhance students' interest in the subject. At the same time, the teacher's communicative skills, pedagogical culture, and ability to apply innovative technologies directly affect the quality of education.

The second important factor is the material and technical base. Modernly equipped classrooms, information technologies, laboratories, and libraries contribute to improving educational effectiveness. In particular, a learning environment organized on the basis of digital technologies develops students' independent working skills.

In addition, the cooperation between family and school has a major impact on educational quality. Parental attention to their children's education raises students' achievement levels. Regular cooperation between the school and parents strengthens the effectiveness of the educational process.

Various methods are used in assessing educational quality. One of the most widely used methods is testing. Tests enable a quick and accurate assessment of students' knowledge levels. In addition, written assignments, interviews, practical tasks, and project work also serve as assessment tools.

In recent years, competency-based assessment systems have been widely applied. In this system, not only the student's theoretical knowledge, but also their practical skills, problem-solving ability, and independent thinking are assessed. This enables a more objective determination of educational quality.

International assessment programs also hold an important place in educational monitoring. Programs such as PISA, TIMSS, and PIRLS, for instance, determine the level of students' knowledge in accordance with international standards. Such studies help identify the strengths and weaknesses of a country's education system.

Digital Technologies in the Monitoring System

Digital technologies have become an integral part of today's education system. Electronic journals and diaries, online platforms, and distance learning systems are simplifying the monitoring process. Teachers and administrators are gaining the ability to rapidly analyze student results through electronic systems.

Platforms based on artificial intelligence are serving as effective tools for individually analyzing students' knowledge levels and providing them with appropriate recommendations. This helps organize the learning process in a student-centered manner.

The digital monitoring system reduces excessive paperwork, simplifies data storage, and improves management effectiveness. For this reason, the use of information technologies in modern schools is one of the important factors in improving educational quality.

The Role of School Leadership in Managing Educational Quality

The school principal is the primary subject in managing educational quality. The principal's management culture, strategic thinking, and innovative approach directly affect the activities of the educational institution. An effective leader supports teachers, creates a healthy pedagogical environment, and is capable of directing the team toward a common goal.

Regular internal monitoring conducted by the principal increases teachers' sense of responsibility. At the same time, motivating teachers and creating conditions for improving their qualifications are also important factors in enhancing educational quality.

Today, working on the basis of democratic principles in school management is of great importance. Making decisions in consultation with the team, and creating an environment of openness and cooperation, serves the development of the educational institution.

Diagnostic Analysis and Pedagogical Competence

Diagnostic analysis plays an important role in the process of monitoring educational quality. Through diagnostic analysis, students' knowledge levels, abilities, and achievement indicators are identified. This process enables teachers to determine which topics students have mastered well or in which areas they are encountering difficulties.

Diagnostic monitoring is not limited to assigning grades. It also serves to track the individual development dynamics of students. As a result, the teacher gains the opportunity to work with each student on an individual basis. This is an important factor in improving educational effectiveness.

In addition, pedagogical strategies are developed based on the results of diagnostic analysis. For example, if low results are recorded in certain subjects, additional classes may be organized or teaching methods may be reviewed.

The quality of education depends largely on the teacher's professional competence. A modern teacher must not only possess thorough knowledge of their subject, but also be capable of applying new pedagogical technologies. This is because today's students are more interested in interactive and innovative methods than in traditional approaches.

Professional competence consists of the following components:

- methodological competence;
- communicative competence;
- information and communication competence;
- psychological-pedagogical competence;
- capacity for creative thinking.

The ongoing professional development of teachers positively affects the quality of education. Seminars, trainings, and the study of international experience serve the professional growth of teachers.

Today, teachers are required not only to impart knowledge, but also to teach students to think independently, solve problems, and adopt creative approaches. For this reason, the innovative activity of the teacher is considered one of the main indicators of educational quality.

Student Motivation and International Experience

Student motivation plays a major role in improving educational quality. Students with high motivation participate actively in lessons, engage in independent inquiry, and achieve high results. For this reason, teachers must work consistently to cultivate students' interest in learning.

One of the effective methods for increasing motivation is encouragement. Acknowledging students' achievements and supporting them with praise and rewards yields positive results. Moreover, the use of interactive methods in lessons also increases students' engagement.

Modern pedagogy views the student as an active subject of the educational process. For this reason, involving students in project work, debates, collaborative activities, and practical exercises improves educational quality.

The experience of developed countries shows that monitoring educational quality is one of the important directions of state policy. In countries such as Finland, South Korea, and Singapore, for example, educational quality is controlled through regular monitoring.

In these countries, the assessment of student knowledge takes into account not only theoretical knowledge but also practical skills, critical thinking, and creative approaches. The considerable attention given to the professional development of teachers serves to maintain a high level of educational quality.

Studying international experience is of great importance for developing Uzbekistan's education system. In particular, introducing digital technologies, developing the competency-based approach, and actively participating in international assessment programs can elevate the quality of education to a new level.

Strategic Planning and Modern Management Approaches

Strategic planning is one of the important elements of educational quality management. Each educational institution must have its own long-term development strategy. This strategy establishes specific goals regarding educational quality, teacher qualifications, the material and technical base, and innovative activities.

School activities are systematically developed through strategic management. In this process, monitoring results serve as the primary source of information. This is because it is impossible to develop an effective plan without analyzing the current situation.

In addition, cooperation with parents, teachers, and the local community holds an important place in strategic planning. A management system organized on the basis of cooperation ensures the stable development of the educational institution.

Today, modern management approaches are widely applied in managing educational quality in the general education system. To manage an educational institution effectively, the principal must function not only as a controller, but also as an organizer, motivator, and strategist. For this reason, the introduction of democratic and innovative forms of management into the education system is of great importance.

One of the modern management approaches is results-oriented management. In this system, the main focus is on the final outcome of the educational process — that is, students' knowledge level, competency, independent thinking, and the development of practical skills are taken as the primary criteria. Such an approach encourages teachers to approach their work with responsibility.

SWOT analysis is also one of the important tools in monitoring educational quality. Through this method, the strengths and weaknesses of the educational institution, its available opportunities, and potential threats are identified. Based on SWOT analysis, strategic plans for developing school activities are developed. This serves to improve management effectiveness.

In addition, the feedback system is of great importance in modern educational management. Regularly studying the opinions of students, parents, and teachers helps improve the quality of education. In particular, the use of anonymous surveys creates opportunities to identify problems in the educational process and address them.

Working with databases is also important in monitoring educational quality. Electronic monitoring systems collect statistical data on students' attendance, grades, subject interests, and activity. Analytical reports are prepared based on this data, and management decisions are made. As a result, an effective management environment is formed in the educational institution.

Furthermore, the introduction of a quality management system in general secondary schools is one of the pressing issues of today. The quality management system helps manage the

planning, implementation, control, and improvement stages of the educational process within a unified system. This system is an effective tool for coordinating teachers' activities and promptly addressing shortcomings in the educational process.

Conclusion

In conclusion, it can be stated that the effective use of modern management approaches and monitoring mechanisms is an important factor in improving educational quality in the general education system. Through the widespread introduction of innovative management technologies, it is possible to increase the competitiveness of the education system and develop it in line with international standards.

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DESIGNING DIGITAL-METHODOLOGICAL SUPPORT FOR STUDENTS' PROFESSIONAL TRAINING

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Abstract. *This article examines the design of digital-methodological support for preparing students for professional activity in the context of higher education digitalization. It identifies the pedagogical, methodological, digital, technical, ergonomic, and information-security requirements for developing digital educational resources, particularly in the teaching of mathematical disciplines with economic content. The study outlines key design principles, including integrativeness, professional and practical orientation, interactivity, visualization, individualization, independent knowledge acquisition, and collaborative work. It also defines the roles of teachers and students in using digital-methodological support to organize learning, assessment, feedback, and independent study. The proposed structure consists of target, methodological, content, technological, activity, control-and-assessment, and reflexive components. The article concludes that well-designed digital-methodological support strengthens interdisciplinary integration, improves students' digital competence, supports professional skill development, and enables teachers to manage, monitor, and enrich the educational process more effectively in response to the demands of a digital economy and modern professional education in practice today.*

Keywords: *digital-methodological support, digital-methodological support of the teacher, digital-methodological support of the student, target component, methodological component, content (information) component, technological component, activity component, control and evaluation component, reflexive component.*

1. Introduction

The rapid development of digital technologies and the digitalization of the economy require the system of preparing students for professional activity to be improved with due regard for the global trend of digitalization. Under conditions of digitalization, preparing students for professional activity is a multifaceted and complex process; these processes have required a reconsideration of the content and structure of student education, of pedagogical approaches, and the development of digital-methodological support (DMS).

In accordance with the "Digital Uzbekistan – 2030" strategy, developed pursuant to Decree No. PF–6079 of the President of the Republic of Uzbekistan dated 5 October 2020, in order to enhance digital skills in the field of education, it is envisaged to implement the measure of "further improving electronic educational resources for the system of preschool, secondary and higher education, as well as ensuring access to domestic and global educational resources" [1].

We agree with V.M. Monakhov's view that "it is impossible to achieve the intended pedagogical result without introducing into the educational process a large volume of information resources and universal skills for using them" [3].

In her article "Pedagogical communication in the electronic educational environment: research and educational approaches," I.N. Rozina emphasizes that information educational

technologies should be understood as the application of information technologies to create new opportunities for transmitting knowledge (the teacher's activity), perceiving knowledge (the student's activity), assessing the quality of knowledge, and the comprehensive development of the student's personality in the educational process [4].

M.N. Skatkin stresses that methodological support is not only a certain system of materials but also a process. In other words, methodological support is the process of equipping activities within an educational program or module with the necessary methodological means that jointly ensure the achievement of the educational goal. Such materials include educational and monitoring materials, supplementary materials describing methods and forms of activity, communication, and so on [2].

By digital-methodological support (DMS) we understand the digital resources necessary for effectively organizing the educational process — including educational-normative, methodological, instructional, information-reference and control materials, pedagogical technologies, as well as electronic educational resources on educational platforms. It systematizes the processes of teaching, learning, assessment and analysis as an integrated whole.

All of the aforementioned components of digital-methodological support are applied in theoretical and practical classes and in organizing students' independent work. Under conditions of digitalization, digital-methodological support is an essential instrument of the educational process and, on the basis of integrating pedagogical and information-communication technologies, organizes an effective learning environment.

2. Methods

Designing digital-methodological support is the process of preparing the electronic learning materials, interactive resources, and assessment and control tools necessary for effectively organizing the educational process, and of systematizing and integrating the use of existing software resources, educational platforms, electronic libraries, scientific databases, and online courses. This process makes it possible to mathematically model economic problems on the basis of digital technologies.

The following principal tasks of designing digital-methodological support were defined: identifying the digital technologies used in teaching mathematical disciplines; updating the subject syllabus and the fund of assessment tools on the basis of digital technologies; preparing electronic learning materials; developing a system of subject-based problems, professionally oriented problems, and situational problems with economic content; preparing interactive models and simulations that allow economic processes to be analyzed and forecast in a digital environment; and implementing a system for organizing and assessing students' independent learning online.

In designing the DMS for preparing students for professional activity in the teaching of mathematics, priority was given to the following principles, which, together with general didactic principles, also encompass profession-specific features:

- **Principle of integrativeness** — within the DMS, the content of educational knowledge is presented through electronic textbooks, study guides and integrative dictionaries that are illuminated on the basis of interdisciplinary connections;
- **Principle of professional orientation** — enriching the learning materials with economic knowledge, for example, by providing problems with economic content concerning supply and demand in the market and finding the surplus of the consumer and the supplier. This is aimed at forming in students the skills and competencies to apply acquired knowledge in professional activity;

- **Principle of practical orientation** — attention is focused on digital educational resources aimed at forming economic-mathematical modeling skills, for example, analyzing economic processes through interdisciplinary projects;
- **Principle of interactivity** — denotes the collaborative cooperation of subject (teacher) – object (DMS) – subject (student), for example, students exchanging views on educational platforms when analyzing economic situations during independent learning;
- **Principle of visualization** — illustrative modeling of economic processes by means of diagrams and graphs helps to understand the essence of economic processes;
- **Principle of individualization** — digital platforms provide tasks corresponding to students' level of mastery;
- **Principle of independent acquisition of knowledge** — DMS resources must give the student the opportunity to acquire knowledge independently and to self-assess;
- **Principle of collaborative work** — relations among the subjects of the educational process based on mutual accord and trust in achieving a common goal, for example, online conferences.

For the teaching of mathematical disciplines, we identified the following requirements for developing the digital educational resources (DER) within professionally oriented digital-methodological support built on interdisciplinary integration:

- **Scientific-methodological requirements** — the DER must be based on modern scientific achievements and conform to the syllabus; in modeling economic processes, concepts, methods, algorithms and models must be correctly formulated and strictly mathematically accurate;
- **Pedagogical requirements** — reliance on the principles of systematicity, continuity, consistency, integrity, and practical and professional orientation; developing creative, analytical and algorithmic thinking in analyzing economic processes; using interactive teaching models; conformity of the structure of the digital-methodological support to the structure of the didactic teaching cycle: theory, practice, independent work, control;
- **Methodological requirements** — continuity of the learning materials; mutual coherence of theoretical and practical classes and independent-learning materials; a system of tasks of varying levels: subject-based problems, professionally oriented problems, and situational problems with economic content; clarity of assessment criteria;
- **Digital requirements** — conformity of the DER to the capabilities of modern computer graphics; interactive models, simulation (visualization of learning materials), automation of computations, and automation of the control-and-assessment process;
- **Technical requirements** — stable operation on technical devices, a convenient and user-friendly interface, and the use of multimedia elements;
- **Information-security and data-reliability requirements** — use of reliable sources, and measures against technical failures and viruses;
- **Ergonomic requirements** — for organizing dialogue; for the visual environment; for text format and knowledge parameters; hypertext for introducing multimedia technologies; telecommunications; and reflective audio-video features, including the features of graphical information.

3. Results

In developing the digital-methodological support, the teacher prepares electronic learning materials and designs the educational process on the basis of integrating pedagogical and digital

technologies. The teacher's activities in developing the digital-methodological support are as follows:

- **develops the subject syllabus:** plans the learning outcomes, develops assessment criteria, defines the competencies, and selects the content of the learning materials;
- **designs the learning materials:** creating an electronic textbook, electronic lectures, online tests, presentations and video lessons; studying the mathematical models of economic processes; developing a set of subject-based and situational problems and individual tasks, and creating their electronic version;
- **selects digital resources:** computer mathematics systems, visualization tools, educational platforms, and websites;
- **organizes interactive teaching:** preparing electronic interdisciplinary crosswords and integrative dictionaries, organizing business games connected with problematic economic situations, developing and conducting interdisciplinary project topics, holding online olympiads and conferences, and developing materials for the student's independent work;
- **assessment —** develops control materials and conducts monitoring and analysis on the basis of assessment criteria, for example, developing automated tests;
- **methodological support:** preparing guidelines for independent learning and organizing consultations for students;
- **reflection:** continuously studying students' feedback in order to analyze the effectiveness of the digital-methodological support, and updating and enriching the digital educational resources.

On the basis of the above, we define the content of the digital-methodological support of the teacher and of the student in preparing students for professional activity.

The teacher's digital-methodological support is a set of methodological developments, electronic learning materials, interactive exercises, software resources, educational platforms, electronic libraries, scientific databases, online courses, and assessment and control tools that make it possible to organize the educational process at a high level, to gain rapid access to information, and to organize, manage and control interactive teaching.

The student's digital-methodological support is a set of methodological support, educational information resources, interactive learning tools, software tools, educational platforms, electronic libraries, online courses, and assessment and control tools designed to enable the student to study effectively in the educational process, to acquire knowledge independently, and to develop professional competencies.

Digital-methodological support helps the student to apply mathematical models in studying general-professional disciplines and in future professional activity, and helps the teacher to develop the skills of using a system of professionally oriented integrative knowledge in teaching mathematics.

The content of the digital-methodological support comprises the following components, each of which performs specific tasks:

Target component. It defines the general aims and tasks of education, encompassing the subject program (syllabus), the educational goal, the competencies, and the learning outcomes.

Methodological component. Methodological guidelines for students on mastering the subject, diagnostics of learning opportunities, instructions for completing independent learning, assessment criteria, and discussion of the types of activity in teaching. It helps the student to correctly organize their activity in the educational process.

Content (information) component. It is oriented toward forming competencies in the subject and ensures the student's acquisition of knowledge. The content (information) component consists of the following blocks: theoretical and practical knowledge (electronic textbook, electronic guide, video lectures, multimedia materials, models, tests) and interactive materials (integrative dictionary, presentations, infographics, simulations).

Technological component. Software resources, videoconferencing tools, educational platforms, electronic libraries, scientific databases, and online courses. In the technological component, the teacher uses platforms to organize the educational process and the student uses them to acquire knowledge. It ensures communication between the teacher and the student.

Activity component. It is oriented toward developing competencies in the subject. The activity component consists of the following blocks: creating digital content, materials for self-instruction (solving subject-based and situational problems, creating digital content, solving crosswords, business games), online consultations, conducting online olympiads and conferences, sending electronic messages, working on educational platforms, in electronic libraries and scientific databases, participating in remote olympiads and conferences, and acquiring knowledge on educational platforms, in electronic libraries and online courses.

Control-and-assessment component. It determines the effectiveness of teaching and identifies and assesses the student's level of knowledge. The control-and-assessment component consists of the following blocks: individual tasks, tests, situational problems and interdisciplinary projects across the types of assessment (current, intermediate (independent learning), final).

Reflexive component. The reflexive component serves to compare goals with learning outcomes (self-assessment, analysis and conclusion), to set new goals for developing competencies, and to improve the educational process.

4. Discussion and Conclusion

Organizing the educational process under conditions of using digital-methodological support ensures interdisciplinary integration and raises the level of development of the student's digital competence. The proposed structure of digital-methodological support — with its target, methodological, content, technological, activity, control-and-assessment and reflexive components — makes it possible to systematize, as an integrated whole, the activities of both the teacher and the student in preparing students for professional activity, and to bring the teaching of mathematical disciplines into line with the demands of a digitalizing economy.

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MODERN METHODS FOR DEVELOPING THE INTELLECTUAL AND CREATIVE COMPETENCE OF FUTURE MATHEMATICS TEACHERS

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Abstract. *This article analyzes the relevance, essence, and pedagogical mechanisms of developing the intellectual and creative competence of future mathematics teachers. The structural components of this competence, manifested as an integrative unity of intellectual and creative abilities, are identified. Furthermore, the paper highlights ways to develop students' non-standard thinking skills through the application of problem-based learning, heuristic methods, and project-based technologies in higher education.*

Keywords: *competence, intelligence, creativity, mathematics education, divergent thinking, problem-based learning, heuristic method, future mathematics teacher.*

Introduction. At the current stage of global educational development, the focus has shifted from preparing merely "knowledgeable" specialists to developing "competent" individuals. This process is particularly complex in the field of mathematics education, as a mathematics teacher must simultaneously possess both strong logical thinking (intelligence) and pedagogical creativity.

Unfortunately, current educational practice demonstrates that many graduates are proficient in solving standard mathematical problems but often struggle to make non-standard decisions in complex pedagogical situations or to foster mathematical thinking among students. Therefore, the issue of developing the intellectual and creative competence of future mathematics teachers remains highly relevant. According to the **World Economic Forum (2023)**, analytical thinking and creativity are among the most in-demand skills of the twenty-first century. In mathematics education, the integration of these two skills is of particular importance. Many researchers, including the American psychologist **J. P. Guilford (1967)**, who introduced the concept of *divergent thinking*, and the German mathematician **E. Ch. Wittmann (2001)**, who proposed the *Design Science* approach to mathematics education, emphasize that teaching should not be limited to transmitting ready-made knowledge but should encourage learners to discover knowledge independently. However, an analysis of pedagogical practice reveals that future mathematics teachers often remain at the level of "technological performers." Although they possess a solid understanding of deductive reasoning and mathematical proof, they frequently encounter difficulties when creating non-standard problems or evaluating students' creative ideas. Similarly, **Shriki (2013)** argued that teacher education should develop the ability not merely to "see" a lesson but to "notice" significant learning opportunities within it.

Literature Review. The concept of **intellectual and creative competence** should not be understood merely as knowledgeability. Rather, it represents a high-level ability in cognitive activity that integrates two major components:

Intellectual Component

- Analytical and synthetic thinking;
- Abstract logical reasoning;

- Culture of mathematical proof;
- Ability to model complex concepts.

Creative Component

- Divergent (multi-variant) thinking;
- Pedagogical improvisation;
- Ability to formulate non-standard problems and identify original solution strategies;
- Mathematical intuition.

Together, these components form a mechanism that enables students to move from a state of "I do not know" to a state of "I will discover." Observations conducted in mathematics education programs revealed several contradictions:

- The conflict between the deductive nature of mathematics (from axioms to conclusions) and the inductive-heuristic nature of creative thinking;
- The tension between highly regulated educational processes and students' need for creative freedom;
- The tendency to rely on ready-made algorithms in the digital era and the low motivation to create independent intellectual products.

Methodology. To develop the intellectual and creative competence of future mathematics teachers, a **problem-based heuristic model called "From Complexity to Simplicity"** can be applied. This model includes three stages.

Stage 1: Analytical-Reflective

At this stage, it is important to present standard word problems with unusual conditions, embedded errors, or excessive information.

For example:

"If the Earth's radius increased by 10 meters, would people be able to walk around the equator?"

Such paradoxical questions encourage logical reflection.

1st Methods:

- Provocative problems;
- Analysis of contradictory situations.

Stage 2: Constructive-Heuristic

At this stage, students become creators of knowledge rather than passive recipients. Students are assigned tasks such as designing original geometric animations or educational games to explain mathematical concepts.

For example:

"How would you explain the Pythagorean Theorem to an eighth-grade student?"

2nd Methods:

- Development of micro-lessons;
- Writing mathematical essays;
- Visual modeling.

Stage 3: Prognostic-Pedagogical

Students learn how to transfer their intellectual products to the minds of school learners. Simulation of pedagogical situations plays a key role at this stage.For example: *"What would you do if a student did not believe the theorem you had just proved?"*Such cases contribute to the development of divergent thinking.

Results and Discussion. If problem-based heuristic technologies grounded in Guilford's divergent thinking models and Wittmann's mathematical design principles are integrated into the educational process, the level of students' intellectual and creative competence will be significantly higher than under traditional approaches. In addition, the **"Find the Error"** approach proposed by **T. Dekker (2014)** can effectively enhance mathematics teaching. Students may be provided with intentionally incorrect proofs, such as:*"The Pythagorean Theorem does not work for a cube because..."* and asked to analyze and identify the errors. Another valuable methodology is **Leikin's (2009) Multiple Solution Tasks approach**, which is highly relevant to the preparation of future mathematics teachers. Students are encouraged to solve a single equation using at least five different methods, such as graphical, matrix-based, and physical modeling approaches.Based on specially designed case studies, students defend open-lesson projects in the format of mathematical presentations. The effectiveness of this process can be evaluated using two criteria:

1. Mathematical Creativity Test (MCT)

Based on Guilford's divergent thinking framework, this test evaluates:

- **Fluency** – the number of solutions generated;
- **Flexibility** – the variety of solution categories (algebraic, geometric, etc.);
- **Originality** – the uniqueness and rarity of proposed solutions.

2. Intellectual Persistence Scale

This criterion measures students' willingness to continue working on difficult logical problems rather than giving up.

As **Shriki (2013)** noted, graduates should become not merely "lesson observers" but "lesson noticers." When designing lessons, they learn to focus not only on logical sequencing but also on generating alternative questions based on the **"What if...?"** principle.

Conclusion. Developing the intellectual and creative competence of future mathematics teachers is not only a means of improving their professional preparation but also a key factor in reforming the quality of mathematics education as a whole. The effectiveness of this process largely depends on transitioning from an information-based and dogmatic educational model to a problem-based and creative one. When teachers are capable not only of understanding complex mathematical theories but also of reconstructing them and inspiring curiosity in students, they contribute to the development of intellectually capable generations. The intellectual and creative competence of mathematics teachers is a continuously evolving integrative quality. The combination of international divergent-thinking methodologies and national pedagogical traditions offers the greatest potential for achieving high educational outcomes.

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GAME-BASED PEDAGOGY IN EARLY CHILDHOOD EDUCATION: FOREIGN PRACTICES, UZBEKISTAN'S DEVELOPMENT TRAJECTORY AND FUTURE METHODOLOGICAL PRIORITIES

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Abstract. *This article analyses the methodological value of game-based pedagogy in early childhood education and examines how selected foreign practices can be adapted to Uzbekistan's preschool education system. The study focuses not on preschool enrolment figures, but on the quality of pedagogical practice, including educator guidance, child participation, learning environment, play structure and developmental outcomes. A comparative-analytical research design was used. The analysis covered international studies on guided play, playful learning curriculum, role play, vocabulary development through play, nature-based play and physical-digital play technologies. The findings show that game-based pedagogy produces stronger results when play is connected with a clear learning aim, flexible adult support and observation-based assessment. Evidence from foreign studies indicates positive effects on early mathematics, vocabulary development, executive functions, collaboration, self-monitoring and problem-solving. At the same time, the article argues that play-based learning should not be understood as entertainment or mechanical activity. Its educational value depends on the educator's ability to organise the environment, guide children without excessive control, and connect play with speech, thinking, social-emotional development and early STEM skills. The article concludes that Uzbekistan needs a national model of play-based preschool methodology rather than direct imitation of foreign practices. Such a model should combine guided play, role play, outdoor developmental tasks, story-based conceptual play and carefully selected physical-digital activities. This approach can support the transition from quantitative expansion of preschool education to quality-centred pedagogical transformation.*

Keywords*: game-based pedagogy; early childhood education; guided play; preschool methodology; play-based learning; Uzbekistan; child development; early STEM; educator guidance; preschool curriculum.*

INTRODUCTION

Early childhood education has entered a new stage in which the main question is no longer only whether a child has access to preschool. The sharper question is different: what kind of pedagogical environment does the child enter, how does the educator work with play, and whether daily activities really develop speech, thinking, social behaviour and emotional self-regulation. In many countries, this shift has already changed the logic of preschool education. Play is not treated as a break between "serious" lessons. It is used as a method of learning, observation, communication and child development.The international situation shows that the quality of early childhood education remains uneven. UNESCO and UNICEF's 2024 global report notes that at

least 6 million additional early childhood teachers will be needed by 2030, and the problem is not only staff shortage, but also the need for pedagogical training that can create a quality early learning environment [1]. This figure is important for the present study because game-based education cannot be introduced only through curriculum documents. It depends on the educator's professional judgement: how to organise a game, when to guide the child, when to step back, how to connect movement with speech, counting, imagination, cooperation and reflection.Uzbekistan has made visible progress in preschool education during the last decade. The coverage of preschool education increased from less than 30 percent in 2017 to over 73 percent in 2024 [2]. This is a serious institutional achievement. Yet the current problem is no longer explained by access alone. UNICEF's 2024 situation analysis directly states that the quality of education, especially foundational skills and competencies, remains a concern [2]. In other words, the system has expanded, but the methodological side now requires deeper work. A preschool group may be open, equipped and formally functioning, but this does not automatically mean that children are learning through meaningful interaction.The same contradiction is visible in the digital sphere. According to UNICEF, 94 percent of schools in Uzbekistan had internet access by 2024 [2]. At first glance, this looks like a strong indicator of modernisation. For preschool pedagogy, however, internet access itself does not solve the core issue. A digital screen can support a game, story, sound, movement or visual task; it can also turn into passive watching if the educator has no clear method. This is why the future of preschool education in Uzbekistan should not be reduced to "more technology". The real task is to design child-centred, play-based and developmentally appropriate digital-pedagogical scenarios.Teacher preparation is another sensitive point. In 2025, UNICEF reported that more than 6,500 preschool teachers and managers in Uzbekistan had benefited from a newly developed in-service training curriculum, while the wider reform is expected to cover about 120,000 preschool personnel, including teachers, managers and methodologists [3]. This means that only the first part of the professional development process has been completed. The scale of the task is much larger. If game-based pedagogy is to become a daily practice rather than a formal slogan, educators need practical tools: observation sheets, play scenarios, role-play models, movement games, early STEM tasks, speech-development games, family-based activities and assessment methods that do not destroy the natural character of play.Foreign experience is useful here, but it should not be copied mechanically. In Finland, play is closely connected with child autonomy and outdoor learning. In Japan, collective games often support discipline, cooperation and social responsibility. Singapore's preschool approach gives more attention to purposeful learning environments, early language development and structured teacher guidance. These examples show one common tendency: play-based pedagogy works only when it has a clear developmental aim. The child is active, but the educator is not passive. The educator observes, asks short questions, changes the situation, notices difficulties and turns ordinary play into a learning episode.For Uzbekistan, the main methodological risk is the superficial use of games. In some preschool practices, a game may remain only an entertaining part of the activity: children move, repeat words, sing or perform an action, but the educator does not connect this process with a concrete developmental result. Such activity looks lively from outside, yet its pedagogical value may be weak. A game becomes educational only when it develops at least one of the following areas: speech and communication, logical thinking, imagination, social cooperation, emotional control, physical coordination, early mathematical concepts or problem-solving.The revised "Ilk Qadam" curriculum has already created a foundation for a more child-centred and competency-based approach. The next stage should be more practical: educators need models showing how the

same curriculum can be implemented through play. A game-based activity should not be written as a decorative element in a lesson plan. It should be planned as a methodological unit: aim, materials, child action, educator's guiding questions, expected developmental result, observation criteria and short reflection.

The future development of preschool pedagogy in Uzbekistan will likely depend on five directions. First, play-based learning will be connected more strongly with early STEM, especially through construction, sorting, measuring, comparing and simple experimentation. Second, speech development will require more dialogic and story-based games, because language is formed not by memorising words alone, but through meaningful communication. Third, social-emotional learning will become more important; migrant family situations, parental busyness, urbanisation and digital distraction already influence children's behaviour and communication habits. Fourth, educators will need assessment tools based on observation rather than formal questioning. Fifth, digital resources will have to be used selectively, with movement, creativity and live interaction kept at the centre.This article argues that game-based pedagogy can become one of the key mechanisms for improving the quality of preschool education in Uzbekistan. Its value lies not in making activities "more interesting", but in changing the structure of learning itself. Through play, the child tests ideas, negotiates with peers, expresses emotions, makes mistakes, repeats actions and gradually builds early cognitive and social competencies. For this reason, the adaptation of foreign experience should focus on methodology: how to organise the game, how to guide it, how to observe the child, and how to connect play with national curriculum goals.The purpose of this study is to analyse foreign practices of game-based early childhood pedagogy and identify their methodological adaptation possibilities for Uzbekistan's preschool education system. The article focuses on the quality problem behind the expansion of preschool education, the professional needs of educators, and the future-oriented role of play in developing children's foundational competencies.

Methodology

The study used a comparative-analytical research design. It examined foreign empirical studies on game-based pedagogy in early childhood education and compared their methodological value for Uzbekistan's preschool education system. The analysis focused not on the number of children enrolled in preschool, but on the quality of pedagogical practice: educator guidance, play structure, child participation, learning outcomes, assessment and the developmental effect of play-based technologies.The materials were selected from recent international studies, randomized trials, systematic reviews and early childhood education research papers. The main attention was given to studies that reported clear samples, intervention design and measurable outcomes. The selected evidence was analysed through four questions: what type of play-based technology was used; who participated in the study; what developmental result was measured; and what this experience can mean for Uzbekistan's preschool pedagogy.

Results and Discussion

The reviewed studies show that play-based pedagogy gives stronger results when the game is not left completely spontaneous. Pure free play may support imagination and emotional comfort, but it does not always produce stable learning outcomes. Direct instruction, on the other hand, can give quick results in narrow skills, but it often weakens child agency. The most productive position is between these two extremes. In the literature this is usually called guided play: the child acts freely inside a prepared situation, while the educator gives short prompts, asks questions, adds materials and observes the child's response.

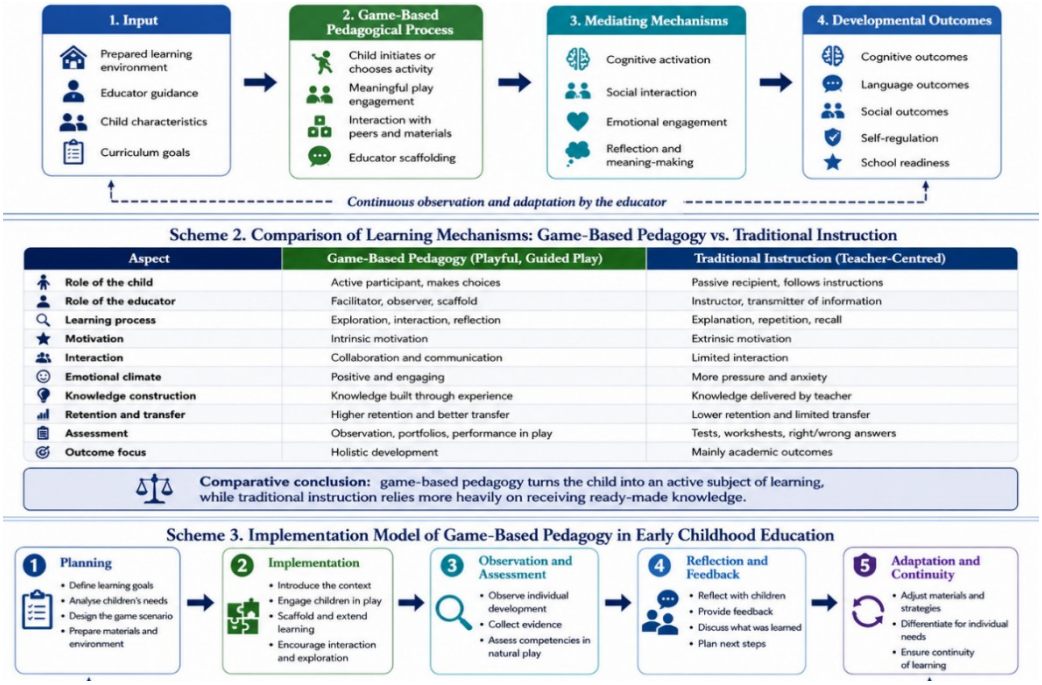


Figure 1. Conceptual schemes of game-based pedagogy in early childhood education

Skene and colleagues analysed 39 studies on guided play in educational contexts and included 17 of them in meta-analysis. Their review shows that guided play is especially meaningful when adult support is flexible, not controlling. The adult does not replace the child's action. The adult notices the child's difficulty and slightly changes the situation so that the child can move one step further [4]. This point is methodologically important for Uzbekistan. In many preschool activities, the educator still tries to keep the whole group under one instruction. Game-based pedagogy requires another skill: the educator must be able to manage learning without turning play into a formal lesson.

The same review also found that guided play produced stronger effects when compared with free play than when compared with direct instruction. One result is especially important: guided play showed a large advantage over free play for spatial vocabulary, with an effect size of g = 0.93, although the authors warn that the studies were heterogeneous [4]. This is not a small detail. It means that children may not automatically learn spatial words such as "inside", "above", "under", "between", "corner", "wide" or "narrow" only because they are playing with blocks. They learn better when the educator enters the game at the right moment: "Where is the small cube?", "What happens if we put it under the bridge?", "Which part is higher?" Such questions do not break the game. They give language to the child's action.

The Norwegian randomized controlled trial gives a more concrete example. Ingrid Størksen and colleagues tested a Playful Learning Curriculum in early childhood education centres. The study involved 96 ECEC centres and 1,313 children. Forty-nine centres were assigned to the intervention group and 47 to the control group. The intervention centres implemented the curriculum for at least eight hours per week over nine months. The results showed significant effects on early mathematics skills: Ani Banani Math Test, d = 0.079, p = 0.03; Preschool Early Numeracy Skills Screener, d = 0.104, p = 0.01. At the same time, there were no significant effects on working memory or expressive vocabulary [5].

This result should be read carefully. The effect sizes were not large, but the study was large and conducted in real educational settings, not in an artificial laboratory. That makes the finding

valuable. It shows that playful learning can improve early mathematical skills when it is supported by a defined curriculum. It also shows the limit of such intervention: one play-based curriculum does not automatically improve every developmental domain. For Uzbekistan, this means that "o'yin texnologiyasi" should not be written as a universal solution. Mathematical play, speech play, role play, movement play and social-emotional play need different tasks, materials and assessment indicators.

The Norwegian experience is useful for another reason. It does not reject free exploration. It enriches it. Children still act, touch, compare, build and search, but the educator has a planned pedagogical line. In Uzbekistan's preschool practice, this can be adapted through small mathematics games: sorting seeds, comparing blocks, building towers of different height, distributing objects among children, measuring paths with footsteps, finding patterns in carpets or ornaments. The key is not the object itself. The key is the question asked during the action.

The United States has produced one of the most discussed examples of role-play-based pedagogy through the "Tools of the Mind" curriculum. Adele Diamond, W. Steven Barnett, Jessica Thomas and Sarah Munro evaluated the programme with 147 five-year-old children in a low-income urban school district. Children were randomly assigned either to the Tools curriculum or to a more traditional curriculum. The children in the Tools group achieved higher results on tasks requiring inhibition and focused attention [6]. The strong side of this study is that it connects play not only with enjoyment, but with executive functions: self-control, working memory and attention.

This experience is directly relevant for preschool education. A child who plays "hospital", "family", "shop" or "driver and passengers" does not simply imitate adults. If the role is organised well, the child must remember the rule, wait for another child, use words according to the role, control impulse and stay inside the story. This is why role play can be stronger than ordinary instruction. A child may not listen to a long explanation about patience, but in a role-play situation the need for patience appears naturally. The game forces the child to regulate behaviour from inside.

For Uzbekistan, this is important because many educators still assess children through visible answers: did the child count, name the colour, repeat the poem, draw the line? Role play gives another type of diagnostic material. It shows whether the child can plan, negotiate, stay in a role, use speech purposefully and accept rules. These indicators are closer to real school readiness than memorised fragments of information.

Vocabulary development studies give another important direction. Tamara Toub and colleagues conducted two studies with low-income preschool children. In the first study, 249 children with a mean age of 59.19 months were randomly assigned to free play, guided play or directed play after shared book-reading. In the second study, classroom teachers implemented the procedure with 101 children, mean age 58.65 months. The findings showed that adult-supported play produced stronger vocabulary gains than free play, and that children had greater expressive vocabulary gains when words were reviewed through play rather than only through picture-card review [7].

This evidence is very useful for Uzbekistan because speech development is one of the central tasks of preschool education. The study shows that a book alone is not enough. A picture card alone is also not enough. A child learns a word more deeply when the word enters action. For example, if the target words are "rescue", "bridge", "empty", "full", "wide", "careful" or "repair", the educator can first read a short story, then create a small role-play or construction game where

children must use these words. The word becomes part of the child's movement and communication. That is why it stays longer.

The Australian line of research is useful through Marilyn Fleer's Conceptual PlayWorld approach. This model builds imaginary play around a story, problem and shared adult-child participation. The educator does not stand outside the game. The educator enters the imaginary situation as a participant and helps children meet a conceptual problem inside the story. Fleer describes this approach as a way to create a motive for learning within play-based settings [8]. The value of this model is that it connects imagination with conceptual thinking.

For example, children may enter a story world where a bridge has broken, a character cannot cross a river, or an animal needs a shelter. The children must build, test, explain and change their solution. In such a case, play becomes early science, early engineering, speech development and cooperation at the same time. This is more powerful than telling children "today we learn about strong and weak materials". The concept appears because the story demands it.

For Uzbekistan, Conceptual PlayWorld can be adapted through national stories, fairy tales and everyday cultural images. A game may be built around "Zumrad va Qimmat", "Alpomish", local market scenes, family ceremonies, farming, building, transport or neighbourhood life. The main condition is that the story must contain a problem. Without a problem, children only perform. With a problem, they think.

Nature-based play also gives strong evidence. A 2022 systematic review by Prins and colleagues analysed 28 qualitative studies with a total sample of 998 children aged 2–8. The review showed that nature-based environments support richer play quality, while teacher-child interaction remains decisive for the educational value of nature play [9]. This is important because outdoor play is sometimes understood only as physical movement. In reality, nature play can develop observation, classification, speech, risk assessment, cooperation and emotional stability.

For Uzbekistan, this direction is practical and low-cost. Not every preschool institution can immediately buy expensive digital equipment or modern STEM kits. But many can organise learning around stones, leaves, water, sand, shadow, seeds, branches, seasonal changes and local plants. A child can compare leaf shapes, sort stones by size, build a road in sand, observe which object floats, describe the sound of dry leaves, or create a story from natural materials. The educator's role is to turn these actions into thinking: "Why is this one heavier?", "Which one is smoother?", "What changed after water was added?", "How can we make the road stronger?"

The digital direction requires more caution. Torres and colleagues reviewed physical-digital play technologies for children aged 0–12. Their search produced 635 papers; 31 met the inclusion criteria, and 17 were considered high enough quality for synthesis. The review found that physical-digital play can support collaboration, decision-making, self-monitoring, problem-solving and physical activity when the technology requires active child behaviour [10]. The most important phrase here is "active behaviour". A screen that only shows cartoons is not a game-based educational technology. A tool that makes the child move, choose, build, speak, correct and cooperate can become educational.

This distinction is crucial for Uzbekistan's preschool digitalisation. There is a risk that digitalisation will be understood as placing screens into groups. That would not solve the pedagogical problem. The better model is physical-digital play: children build a route for a small robot, match picture and sound, move cards on an interactive board, solve a team puzzle, record their own story, or use digital prompts after manipulating real objects. The technology must not replace speech, hands, movement and peer interaction. It must strengthen them.

The reviewed studies also show one common limitation. Play-based technologies do not work equally in all conditions. They require trained educators, prepared materials, flexible time, observation skills and a clear link with curriculum goals. If the educator only writes “game method was used” in the lesson plan, nothing changes. If the game has aim, action, problem, child choice, adult guidance and assessment, then it becomes a real pedagogical technology.

For Uzbekistan, the practical conclusion is clear. The country does not need to copy one foreign model. It needs a combined national model. From Norway, it can take curriculum-based playful mathematics. From the United States, it can take role play for self-regulation and executive functions. From vocabulary studies, it can take adult-supported play after book-reading. From Australia, it can take story-based conceptual play. From nature-play research, it can take outdoor developmental tasks. From physical-digital play research, it can take the principle that technology must keep the child active.

The main expected effect of such adaptation is not only that children will “enjoy the lesson”. The deeper effect is different. Children begin to speak more naturally, compare objects, explain their choices, wait for their turn, accept roles, solve small problems, correct mistakes and cooperate. These are the real foundations of school readiness. They cannot be formed only by memorisation. They need action, repetition, emotion and social interaction.

Therefore, game-based pedagogy should be understood as a quality-improvement mechanism in preschool education. It helps move the system from formal activity planning to child-centred developmental practice. In Uzbekistan’s current reform context, this is especially important. The next stage of preschool development will be judged not only by coverage indicators, but by what happens inside the group: how the educator speaks, how children act, how play is organised, and whether every game leaves a developmental trace.

Conclusion

The analysis shows that game-based pedagogy is effective only when play has a clear developmental purpose. Foreign studies prove that guided play, role play, vocabulary play after book-reading, nature-based play and physical-digital play can improve children’s early mathematics, speech, self-regulation, collaboration and problem-solving skills. The strongest result appears when the educator does not dominate the child, but also does not leave the play completely uncontrolled.

For Uzbekistan, the main task is not to copy foreign preschool models. The real need is to build a national methodology of play-based learning. This methodology should connect the “Ilk Qadam” curriculum with practical play scenarios, observation-based assessment, educator training and culturally familiar materials. In this way, play becomes not a decorative part of the lesson, but a quality-improvement mechanism in preschool education.

The study concludes that the future development of preschool pedagogy in Uzbekistan should focus on three priorities: preparing educators for guided play, creating age-appropriate game-based technologies, and assessing children’s development through observation of real activity. Such an approach can help move preschool education from formal activity planning to child-centred developmental practice.

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FROM EXPANSION TO QUALITY: AN INTEGRATED MANAGEMENT MODEL FOR TEACHING STAFF AND FINANCIAL RESOURCES IN NON-STATE PRESCHOOL EDUCATION

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Abstract. *Non-state preschool education is expanding quickly, but the next challenge is no longer only access. Quality depends on how teaching staff and financial resources are managed inside each organisation. The study analyses this issue through policy documents, official statistics, international quality frameworks and management theories. The main argument is that staff development, motivation, internal monitoring and budget planning should work as one system. A proposed integrated management model connects teacher capacity assessment with financial resource allocation, making professional development more realistic and quality control more stable. The model is especially relevant for non-state preschool organisations where parental trust, staff retention and financial sustainability are closely linked. Gradual implementation through teacher profiles, mentoring, observation sheets, feedback tools and training budgets can help organisations move from numerical expansion toward sustainable educational quality.*

Keywords*: non-state preschool education, teaching staff capacity, financial resources, integrated management model, early childhood education, internal monitoring, staff development, quality management, preschool leadership, sustainable quality.*

Introduction

Early childhood education is no longer viewed only as a preparatory stage before school. In many countries it has become a separate field of social investment, human capital formation and educational management. This shift is especially visible in the growing role of non-state providers. According to a background study prepared for the UNESCO Global Education Monitoring Report, non-state providers educate about 41% of all pre-primary students worldwide, while their share is much lower at the primary and secondary levels - 14% and 19%, respectively [1]. This means that preschool education is one of the education sectors where private, family-based, community and other non-state actors are most actively involved. Uzbekistan reflects this global tendency, but with a much faster pace of change. UNESCO country materials report that the share of pre-primary students enrolled in private institutions in Uzbekistan increased from 2% in 2016 to 9% in 2022 and reached 41% in 2024 [2]. The World Bank also notes a sharp rise in preschool enrolment: the number of children aged 3–7 enrolled in preschool education increased from 0.7 million in 2017 to 2.44 million in 2024, while coverage grew from 27% to 75% [3]. These figures show clear progress in access. At the same time, they raise a more difficult management question: how can a rapidly expanding preschool sector move from numerical growth to stable quality? The issue is particularly important for non-state preschool education organisations. By the end of 2024,

Uzbekistan had 38,058 preschool education organisations, including 28,729 family-based non-state preschool organisations. Compared with 2023, the number of family-based non-state organisations increased by 1,871 units, or 7.0% [4]. Such growth shows that the non-state sector is no longer a marginal supplement to the public system. It has become one of the main organisational forms through which preschool access is being expanded. However, the scale of expansion also changes the nature of management inside these organisations. A non-state preschool manager has to deal not only with enrolment and daily administration, but also with staff recruitment, salary planning, professional development, parental expectations, quality monitoring and the rational use of financial resources. The pressure on management becomes clearer when child enrolment and staff growth are compared. In 2024, preschool education organisations in Uzbekistan served 2,350.0 thousand children, which was 180.5 thousand children, or 8.3%, more than in 2023. During the same period, the number of pedagogical staff reached 174.6 thousand, increasing by 7.0 thousand, or 4.2% [4]. Thus, the number of children grew almost twice as fast as the number of teaching staff. This imbalance does not automatically mean a crisis, but it signals a real risk: if staff capacity, workload, motivation and professional support are not managed systematically, wider access may not lead to better educational outcomes. For this reason, the present article does not treat expansion as the final result of reform. Expansion is only the first stage. The next stage is quality, and quality depends on how teaching staff and financial resources are managed together. In non-state preschool education, these two elements cannot be separated. Decisions about teachers' salaries, training costs, group size, methodological materials, digital tools and parental fees directly influence the quality of the educational process. If financial management is reduced only to cost control, staff development suffers. If staff development is discussed without financial planning, proposed improvements remain formal. The problem, therefore, is not simply whether non-state preschools are increasing in number, but whether they have a management model capable of turning growth into sustainable quality.This issue is also reflected in recent policy priorities. The Cabinet of Ministers of Uzbekistan set the task of increasing preschool coverage to 80% in 2025–2026 and establishing 2,000 new non-state preschool education organisations, including private, public-private partnership and family-based institutions [5]. These targets confirm that the non-state sector will continue to expand. Yet the same policy direction also makes internal management more important. New organisations will need qualified staff, stable financing, transparent monitoring and mechanisms for maintaining parental trust. Without these components, the system may gain more places but not necessarily stronger educational quality. The relevance of this study is therefore determined by a practical contradiction. On the one hand, Uzbekistan has achieved a major expansion of preschool education, and non-state organisations have played a visible role in this process. On the other hand, rapid expansion increases the need for a more integrated model of management - one that links teaching staff capacity with financial resource allocation. This article addresses that gap by proposing an integrated management perspective for non-state preschool education organisations. The focus is on how staff development, motivation, internal monitoring and financial planning can be combined into one coherent management system aimed at sustainable quality rather than growth alone.

Literature Review

The literature on non-state preschool education is not limited to the question of access. In earlier discussions, private and family-based providers were often treated as a way to "add more places" where the public sector could not expand quickly. Recent studies take a more cautious view. UNESCO's Global Education Monitoring Report argues that non-state actors are not only

service providers; they also influence standards, financing, parental choice, accountability and the daily conditions in which children learn [6]. For this article, that point is central. A non-state preschool cannot be assessed only by the number of children it enrols. Its real value depends on how staff, money, learning conditions and quality control are managed inside the organisation. D. Baum's work on non-state actors in early childhood education gives a useful starting model. He shows that non-state preschools can expand access faster, especially where the state network is limited, but the effect on equity and quality is mixed. The mechanism is quite simple: when private or family-based institutions open quickly, families receive more options; at the same time, quality may become uneven if licensing, staff requirements, fee regulation and monitoring are weak [7]. This model works well for explaining the Uzbek case. The country has rapidly increased preschool coverage, and non-state providers have become important in that process. The next question is no longer "how many organisations exist?", but "what kind of management system keeps their quality stable?"

The second group of studies focuses on ***quality frameworks*** in early childhood education. OECD research treats quality as a combination of structural and process conditions. Structural conditions include staff qualification, child–staff ratio, group size, funding and regulatory standards. Process quality is more sensitive: it appears in teacher–child interaction, emotional climate, play-based learning, communication with parents and the way children are supported during the day. OECD stresses that staff training, professional development, ratio standards and monitoring are not separate technical details; together they activate quality in early childhood systems [8]. This is important for an integrated management model, because staff capacity cannot be improved without financial decisions behind it: salaries, training costs, substitute staff, materials and digital tools all require planning. The European Quality Framework gives another model that is useful for this article. It identifies five linked areas: access, workforce, curriculum, evaluation and monitoring, and governance and funding [9]. Its strength is that it avoids a narrow view of quality. A preschool may have access, but no stable staff. It may have teachers, but weak monitoring. It may have a curriculum, yet no money for materials or professional development. The mechanism of this model is therefore integrative: quality is produced when workforce policy, curriculum practice, evaluation and funding move in the same direction. For non-state preschool organisations, this is especially relevant. If financial management is separated from pedagogical management, improvement remains on paper. A separate body of literature deals with ***professional capital***. A. Hargreaves and M. Fullan argue that educational quality depends on three forms of capital: human capital, social capital and decisional capital [10]. Human capital refers to the knowledge and skills of individual teachers. Social capital is built through professional interaction, trust and shared practice. Decisional capital means the ability of teachers and leaders to make sound professional judgements in real situations. This model is stronger than the usual "qualification-based" view of staffing. It explains why a diploma alone does not guarantee quality. A teacher may be formally qualified but still need mentoring, peer learning, feedback and space for professional judgement. In a non-state preschool, this mechanism matters even more because small teams often rely on a few key people. If those people are not supported, the organisation becomes fragile. The literature on educational leadership also helps to understand why management effectiveness cannot be reduced to administration. T. Bush describes educational management as a field where leadership, organisational structure, culture and decision-making are interdependent [11]. In a non-state preschool, the director is not only a formal head. Often the same person negotiates with parents, hires teachers, controls fees, solves staffing problems, checks classroom

quality and protects the organisation's reputation. This creates a dense management load. A weak leader may react only after problems appear. A stronger model is preventive: staff needs are identified early, financial risks are calculated, parents receive regular information, and internal monitoring becomes routine rather than an emergency measure. M. Fullan's theory of educational change adds another useful explanation. Reforms do not become real only because a policy document is adopted. Change becomes visible when it alters everyday practice: how teachers plan, how leaders give feedback, how colleagues learn from each other, how data are used and how mistakes are corrected [12]. Applied to non-state preschool education, this means that opening new organisations or increasing enrolment is only the surface of reform. The deeper layer is inside the organisation. If professional development, financial planning and quality monitoring are not embedded in daily routines, expansion may remain numerical rather than educational. Financial-management studies in early childhood education point to a similar conclusion. OECD's *Starting Strong* materials note that governance and financing approaches influence quality in ECEC systems [13]. This link is sometimes underestimated. In practice, financial decisions shape pedagogical possibilities. A low training budget limits professional growth. Low wages increase staff turnover. Large groups may improve short-term income, but they reduce the time a teacher can spend with each child. Underfunded materials weaken curriculum implementation. The mechanism is direct: money is converted into working conditions, and working conditions are converted into pedagogical quality. For this reason, an integrated model should not put "pedagogy" and "finance" into separate boxes. They are parts of the same management chain.

Research on structural quality gives a practical warning. Child–staff ratios and group size are repeatedly used in OECD materials as indicators of ECEC quality, even though they do not capture everything. Their importance lies in the fact that they influence the possibility of meaningful interaction. When one teacher is responsible for too many children, observation becomes weaker, individual support decreases, and the emotional climate becomes harder to maintain [14]. This is not only a staffing issue. It is also a financial issue, because hiring more staff increases costs. Non-state providers may feel pressure to keep groups full in order to remain financially stable. The integrated model proposed in this article is built exactly around this tension: quality requires staff investment, while sustainability requires careful financial planning.

The World Bank's recent materials on Uzbekistan show why this debate is not abstract. Preschool enrolment of children aged 3–7 in Uzbekistan rose from 0.7 million in 2017 to 2.44 million in 2024, while coverage increased from 27% to 75% [15]. This is a major achievement in access. Yet fast growth creates a management problem: staff development, finance, monitoring and parental trust must grow at the same time. If one part develops faster than the others, the system becomes unbalanced. For example, enrolment can grow faster than teaching capacity; facilities can expand faster than methodological support; parental demand can increase faster than internal quality assurance. The reviewed literature shows that several models have already proved useful, but each explains only part of the problem. The non-state actor model explains expansion and regulation. The quality framework explains the link between workforce, curriculum, monitoring and funding. The professional capital model explains how teacher capacity is built inside teams. Leadership theory explains the role of the manager. Financial-management literature explains why resource allocation affects quality. What is still weakly developed is their integration for non-state preschool organisations. This is the research gap of the present article. Non-state preschools need a model where teaching staff capacity and financial resources are managed together, not after one another.The proposed direction can be formulated as follows: expansion creates access, but

integrated management creates quality. A non-state preschool becomes sustainable only when its manager can connect four processes in one cycle: staff selection and development, financial planning, internal monitoring and quality improvement. If these processes work separately, the organisation may survive administratively but remain unstable pedagogically. If they work together, growth begins to turn into quality.

Methodology

This study used a mixed analytical design combining documentary analysis, statistical interpretation and model-building. The documentary part relied on policy documents, official statistics on preschool education in Uzbekistan, and international studies on early childhood education management. The statistical part focused on the growth of non-state preschool organisations, child enrolment, teaching staff dynamics and the imbalance between expansion and staff capacity. In addition, relevant theoretical models were reviewed, including quality frameworks in early childhood education, professional capital theory and educational leadership approaches [6; 8; 10; 11].The final stage of the research was conceptual modelling. Based on the identified problems, the article develops an integrated management model that links teaching staff capacity with financial resource allocation. The purpose of the model is not only to describe the current situation, but also to explain how non-state preschool organisations can move from rapid expansion to sustainable quality.

Results and Discussion

The analysis shows that the main problem of non-state preschool education is not expansion itself. Expansion is necessary, and in Uzbekistan it has already produced visible results. The more difficult issue begins after growth: how to maintain quality when the number of children, organisations and parental expectations rise at the same time. In this situation, teaching staff management and financial management cannot be treated as two separate administrative fields. They influence each other directly.

A preschool organisation may have qualified teachers, but if there is no budget for training, teaching materials, substitute staff or fair incentives, professional capacity remains limited. The opposite is also true. A non-state preschool may have stable income from parental fees, but if money is spent only on facilities and daily costs, without investment in teachers and internal monitoring, quality will not improve. This is why the proposed model is based on integration: staff capacity and financial resources must be planned, monitored and evaluated together.

The proposed model consists of five connected blocks.

First, diagnosis of teaching staff capacity.At this stage, the organisation identifies the real professional profile of each teacher: qualification, experience, classroom practice, communication with parents, ability to work with children of different needs and readiness for professional learning. This should not be a formal check of documents only. The director or methodologist needs to understand where the teacher is strong and where support is needed.

Second, financial mapping of pedagogical needs.Every staff-related need has a financial side. Training requires payment or time. Mentoring requires workload adjustment. Better classroom practice requires materials. Motivation requires incentives. Therefore, the organisation should connect pedagogical needs with the budget. This makes staff development realistic rather than declarative.

Third, integrated planning.The model proposes one joint plan instead of separate “staff plans” and “financial plans”. For example, if internal monitoring shows weak parent communication, the organisation plans a short training session, assigns a mentor and allocates

funds for communication tools or methodological materials. If group size is too large, the financial plan should consider additional staff or redistribution of children. In this way, finance begins to serve pedagogical quality.

Fourth, implementation through internal mechanisms.The model can be implemented through practical tools: quarterly staff assessment, mentoring for young teachers, internal lesson observation, short professional development sessions, parent feedback analysis and transparent incentive rules. These mechanisms are not complicated, but they must be regular. Occasional training or inspection does not change the organisation. Repeated small actions do.

Fifth, monitoring and correction.The final block is feedback. The organisation compares planned results with actual changes: whether teacher performance improved, whether parental complaints decreaased, whether staff turnover became lower, whether children received more stable educational support. If the expected result is not achieved, the plan is corrected. This makes the model cyclical rather than one-time.

The mechanism of the model can be shown as follows:

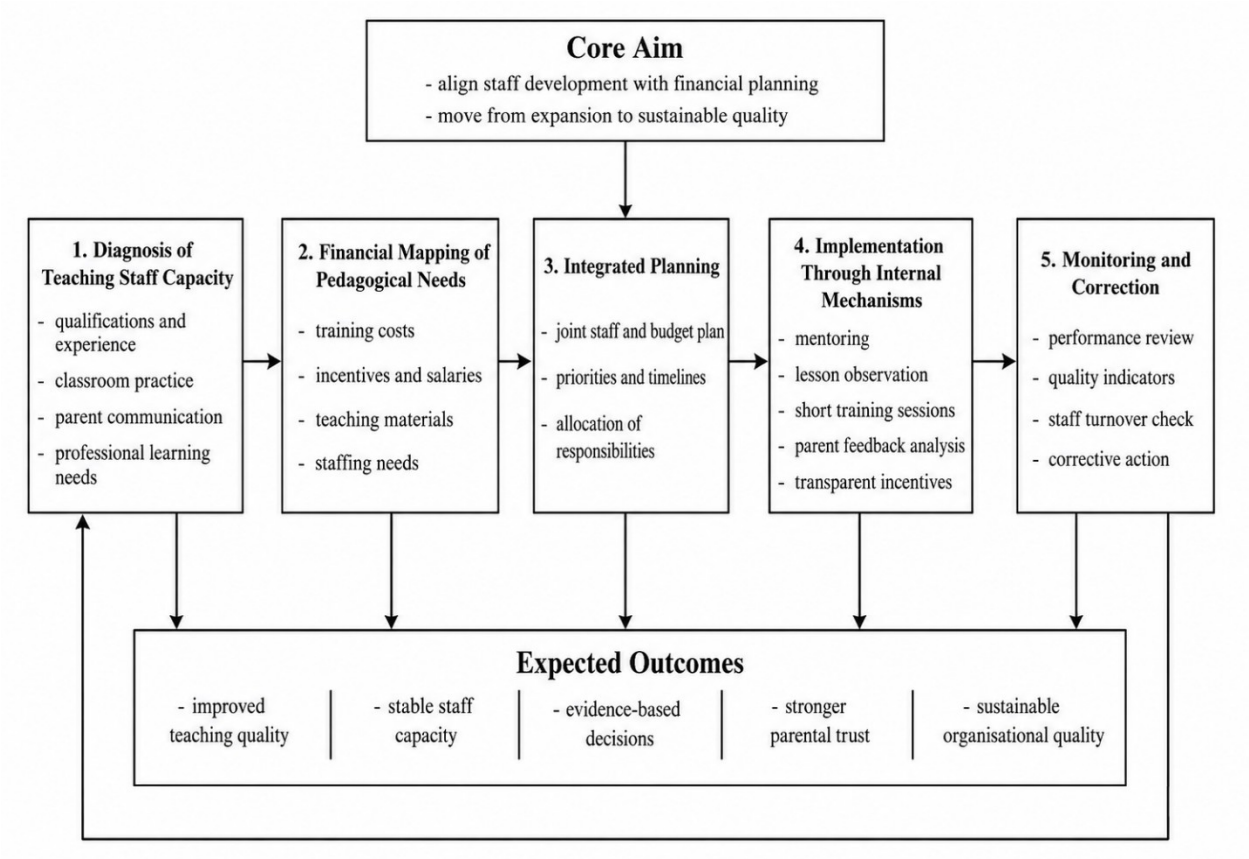


Figure 1. Integrated management model for teaching staff capacity and financial resources in non-state preschool education

The practical implementation mechanism can be shown separately:

The expected effect of the model is that management becomes more evidence-based. The director no longer decides only by intuition or immediate financial pressure. Decisions are made through the connection between pedagogical needs and available resources. This is especially important for non-state preschool organisations, where financial sustainability and educational quality are closely tied to parental trust.At the same time, the model has several implementation difficulties. The first difficulty is limited managerial competence. Many non-state preschool managers are forced to deal with finance, staff, parents and documentation at once. Not all of them

have enough preparation in educational management. The second difficulty is financial constraint. Small family-based preschools may understand the need for staff development but have limited funds to support it. The third difficulty is resistance to monitoring.

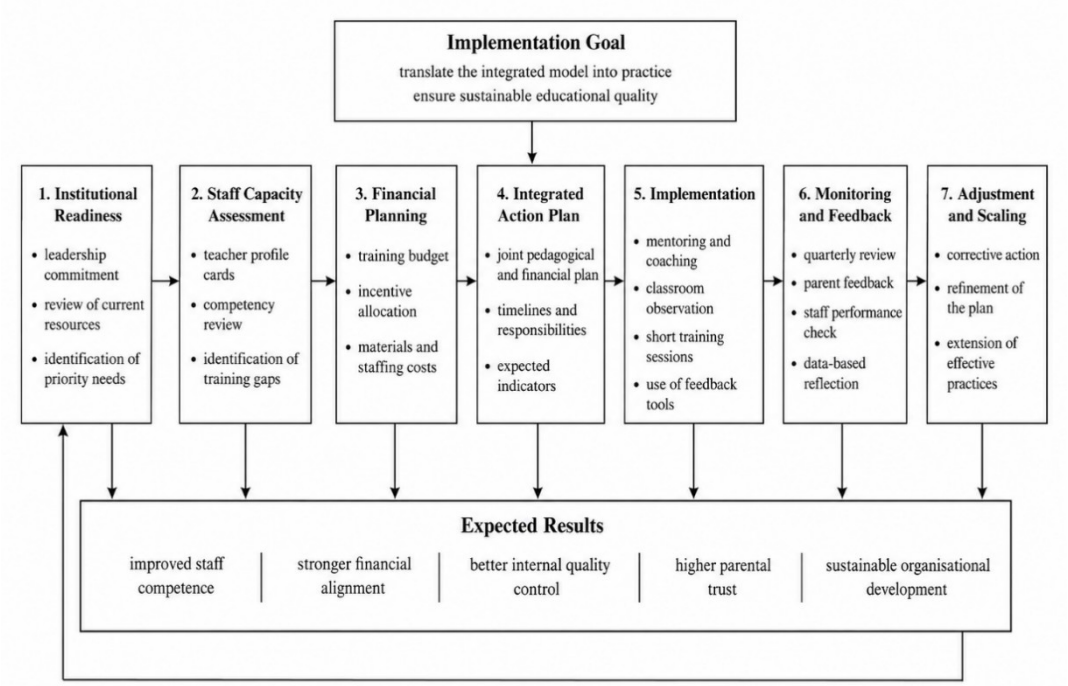


Figure 2. Mechanism for implementing the integrated management model in non-state preschool organisations

Teachers may perceive observation and assessment as pressure if the organisation has no culture of professional feedback. The fourth difficulty is weak data use. Many organisations collect information, but do not use it for decision-making.These challenges do not make the model unrealistic. They show that implementation should be gradual. At the first stage, a non-state preschool can introduce simple tools: a teacher profile card, a quarterly observation sheet, a small training budget and a parent feedback form. At the second stage, these tools can be linked to financial planning and staff motivation. At the third stage, the organisation can move toward a full integrated management cycle.Thus, the proposed model helps shift the focus from “opening more preschool places” to “managing quality inside each organisation”. For non-state preschool education, this shift is essential. Expansion creates access, but only integrated management can turn access into stable educational quality.

Conclusion

Rapid expansion of non-state preschool education creates access, but access alone does not ensure quality. The main risk is the gap between organisational growth and the internal capacity to manage teachers, workload, parental expectations and financial resources. For that reason, teaching staff management and financial planning should not be handled separately.The proposed integrated model links teacher capacity, professional development, internal monitoring, incentives and budget allocation in one management cycle. Such a model helps non-state preschool organisations move from short-term survival to stable quality. Its practical value lies in simple but regular mechanisms: teacher profiling, quarterly observation, targeted training, transparent motivation and finance-based planning of pedagogical needs. The model may face difficulties, especially limited budgets, weak data use and insufficient managerial competence, yet gradual implementation makes it realistic for family-based and private preschool organisations.

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INTEGRATION OF THE INTERCULTURAL APPROACH INTO TEACHING RUSSIAN AS A FOREIGN LANGUAGE TO STUDENTS OF TRANSPORT-RELATED SPECIALITIES

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Abstract. *This article examines the integration of an intercultural approach into the process of teaching Russian as a foreign language (RFL) to students of transport-related specialities. The theoretical foundations of intercultural communication, the significance of the linguocultural approach, and the role of culture-specific units in the educational process are analysed. The study employs the methods of comparative analysis, linguocultural analysis, and pedagogical observation. Particular attention is devoted to the practical use of culture-specific elements of the peoples of Central Asia in teaching RFL. It is concluded that the formation of intercultural competence fosters the development of communicative skills, professional adaptation, and a tolerant worldview among learners.*

Keywords: *intercultural competence, Russian as a foreign language, linguocultural studies, cross-cultural communication, culture-specific elements, communicative competence.*

1. Introduction

The current stage in the development of the transport sector is characterised by the active integration of national transport systems into the international logistics space. The development of international transport corridors, the digitalisation of logistics processes, and the expansion of international cooperation and academic mobility create a need to train specialists capable of carrying out their professional activities effectively under conditions of intercultural interaction.

In the professional activity of transport specialists, communication with representatives of diverse cultural and linguistic communities occupies a significant place: foreign partners, logistics companies, international carriers, passengers, and representatives of foreign organisations. Accordingly, command of a foreign language is regarded not only as a means of transmitting information but also as an instrument of intercultural communication that ensures successful professional adaptation and prevents communicative conflicts. Under these conditions, the teaching of Russian as a foreign language acquires particular relevance, since Russian continues to function as a language of inter-ethnic and professional communication across the post-Soviet space and within the international transport domain. However, the practice of teaching RFL demonstrates that the traditional approach, oriented primarily towards the formation of linguistic skills, is insufficient for preparing specialists for genuine intercultural interaction.

An inadequately formed intercultural competence leads to difficulties in professional communication, the distortion of communicative intentions, cultural barriers, and a decline in the effectiveness of interaction within a multicultural environment. In the transport sector, such communicative failures may adversely affect not only the quality of professional activity but also the organisation of international transport operations, business negotiations, and joint projects. This gives rise to the need to integrate the intercultural approach into the process of teaching Russian as a foreign language to students of transport-related specialities.

Aim of the study. To determine the pedagogical conditions for forming the intercultural competence of students at a transport university in the course of teaching Russian as a foreign language.

Objectives of the study:

- To reveal the significance of intercultural competence in the professional training of transport specialists.
- To determine the role of the linguocultural approach in teaching RFL.
- To identify effective methods of forming intercultural competence.
- To analyse the results of the practical application of the intercultural approach at a transport university.

Scientific novelty. The scientific novelty of the study lies in substantiating the integration of the intercultural approach into the professionally oriented teaching of RFL to students of transport-related specialities through a system of communicative and culturally oriented learning situations.

2. Materials and Methods

The empirical part of the study was conducted among students of a transport university in the course of studying the discipline "Russian as a Foreign Language." The following research methods were employed:

- comparative analysis;
- linguocultural analysis;
- pedagogical observation;
- analysis of professional-communicative situations;
- cooperative learning methods;
- elements of case-study technologies.

In contemporary humanities scholarship, intercultural competence is understood as a body of knowledge, communicative skills, and personal qualities that ensure effective interaction with representatives of other cultures. The intercultural approach is defined as the organisation of instruction that takes into account the interaction between language and culture and that is aimed at forming the ability to communicate effectively with representatives of other cultures. The intercultural approach thereby contributes to the formation of learners' intercultural competence.

For transport specialists, intercultural competence is of particular importance, since professional activity in the field of international logistics and transport requires:

- the capacity for intercultural dialogue;
- communicative flexibility;
- knowledge of the national and cultural specifics of business communication;
- the ability to adapt speech behaviour according to the communicative situation.

Language is a carrier of cultural values, behavioural models, and a national worldview; consequently, the teaching of RFL is impossible outside the cultural context. Of particular significance is the linguocultural approach, which is oriented towards the study of language through the culture of its native speakers. This approach fosters the development of tolerance, cultural awareness, and the ability to interpret cultural meanings.

3. Results

Methods of forming intercultural competence. On the basis of the study, several methods were identified and applied for the formation of intercultural competence.

1) Comparative analysis of cultures. Comparing cultural traditions, models of speech behaviour, and national features of communication fosters the development of students' analytical thinking and intercultural sensitivity. For example, comparing the features of business communication among representatives of Uzbek and Russian cultures enables learners to become aware of differences in communicative strategies, forms of speech etiquette, and models of professional interaction.

2) Work with culture-specific vocabulary. An important element of teaching RFL is work with non-equivalent vocabulary, realia, and culturally marked units. Words such as *mahalla*, *dasturkhan*, and *sumalak* require not only translation but also a cultural commentary. Working with such units fosters skills in interpreting cultural meanings and prevents intercultural communicative difficulties. In the course of the study, materials from the author's "Collection of Culture-Specific Elements of the Peoples of Central Asia" were used.

3) Modelling of professional-communicative situations. An effective means of forming intercultural competence is the modelling of professional situations related to the transport sector:

- negotiations with foreign partners;
- processing of international transport operations;
- interaction with passengers;
- resolution of communicative conflicts.

Such tasks foster the development of communicative flexibility and skills of adaptation to a multicultural professional environment.

4) Cooperative learning and discussions. The use of cooperative learning technologies ("team learning," "learning together," discussions, and group projects) fosters the development of intercultural interaction skills and learners' communicative activeness. Tasks involving the discussion of national traditions, professional etiquette, and the features of business communication in different cultures proved particularly effective.

Practical results. The results of pedagogical observation showed that the integration of an intercultural component into the process of teaching RFL contributes to:

- an increase in students' communicative activeness;
- the development of professional communication skills;
- a reduction in intercultural communicative barriers;
- the formation of a tolerant attitude towards representatives of other cultures;
- increased motivation to study Russian.

Students in the experimental groups demonstrated a higher level of communicative adaptation when modelling professional situations of international interaction.

4. Discussion and Conclusion

Thus, the formation of intercultural competence in the process of teaching Russian as a foreign language constitutes an important condition for the professional training of transport specialists. The integration of the intercultural approach into the teaching of RFL fosters the development of communicative flexibility, cultural awareness, and the ability to interact effectively within a multicultural professional environment.

The use of the linguocultural approach, professionally oriented case studies, comparative analysis of cultures, and cooperative learning technologies makes it possible to enhance the effectiveness of preparing future specialists for the transport sector. Under the present-day conditions of the globalisation of the transport space, intercultural competence should be regarded as an integral component of the professional training of students at transport universities.

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ENHANCING PROFESSIONAL TRAINING THROUGH DEVELOPING CREATIVE COMPETENCES IN STUDENTS

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Abstract. *This article presents an in-depth scientific investigation of the pedagogical conditions and effective pathways for developing creative competencies to enhance students' professional readiness. Amid the dynamic demands of the modern labor market and the formation of an information society, a specialist's creative competence is regarded as a significant predictor of professional success. The article analyzes the conceptual content of creative competencies, their integration into the structure of professional readiness, as well as the pedagogical technologies and methods for developing these competencies. Research findings demonstrate that the formation of creative competencies substantially improves students' abilities to apply professional knowledge in practice, solve problems, and develop innovative solutions in professional situations.*

Keywords*: creative competencies, professional readiness, professional development, creative thinking, competency-based approach, pedagogical technologies, problem-based learning, project method, innovative activity, self-directed learning, professional adaptation.*

Introduction. The 21st century is characterized by the rapid development of information and communication technologies, global economic integration and the implementation of new achievements of science in practice. These processes have fundamentally changed the requirements of the modern labor market, requiring from specialists working in it not only deep knowledge and solid skills, but also the ability to quickly adapt to new situations, develop non-traditional solutions and constantly improve their activities. These requirements are especially relevant for teachers, since they are directly involved in the formation of the future generation. One of the main tasks of the modern higher education system is to form the professional training of students. The concept of professional training has a broader content than the traditional one, it includes not only knowledge, skills and experience, but also the psychological, cognitive and moral-spiritual preparation of a person for professional activity [1]. At the same time, creative competencies occupy a special place as an important component of professional training within the framework of the modern competency approach. Creative competencies are a set of abilities of a person to generate new ideas, solve problems in an original way, and carry out his activities in an innovative way. They are the main condition for a student to achieve high results not only during his studies, but also in his future professional activities [2].

Therefore, the scientific study of the theoretical foundations, pedagogical conditions and practical ways of improving professional training through the development of creative competencies in students is considered an urgent scientific problem.

The purpose of this article is to scientifically substantiate the pedagogical conditions, effective mechanisms and practical directions of improving professional training through the development of creative competencies in students.

Methodology. In modern pedagogy, the concept of competence has been widely studied by O.B. Anisimova, A.V. Khutorsky, I.A. Zimnyaya and other scientists [3]. I.A. Zimnyaya interprets competence as a person's ability to demonstrate himself in a certain field of activity [4]. The concept of creativity has been deeply studied in psychology. J.P. Guilford saw creativity as a manifestation of divergent thinking and identified its four components - flexibility, fluency, novelty and accuracy [5]. E.P. Torrens interpreted creativity as a process of perceiving problems, identifying gaps in information and testing new ideas [6]. The concept of creative competencies began to take shape in modern educational paradigms. This concept was first used as a construct denoting the relationship between creativity and competence.

Creative competencies are the ability of an individual to apply creativity in various areas of professional activity. This concept includes not only the generation of creative ideas, but also their implementation, evaluation and improvement [7].

Figure 1. Components of creativity



Creative competencies are considered one of the main outcomes of modern education. The Council of Europe's document "For high-quality competences in a European framework" includes creativity and innovation among the key competencies [12]. The Law of Uzbekistan "On Education" also lists the development of students' creative abilities as one of the priority tasks of the country's education policy.

At this point, it is also necessary to touch upon the concept of professional training. In the traditional approach, professional training is mainly interpreted as a set of knowledge, skills and experience. However, the modern approach considers this concept in a broader context.

A.K. Markova characterizes professional training as a person's compliance with the psychological and pedagogical conditions necessary for acquiring and successfully implementing a particular profession [13]. V.A. Slastenin considers professional training as a system of professional knowledge, professional skills, professional experience and professional personal qualities [14].

The study studied the effectiveness of improving students' professional training through the development of creative competencies. The study was conducted based on the following methods. In particular, literature analysis, comparison, generalization, systematic analysis, pedagogical observation, interview, questionnaire survey, etc.

Result. The results of the study confirmed a significant increase in the indicators of students' professional readiness through the development of creative competencies. The control group used a traditional approach, and the growth rates there were 4-7%. This confirms the

effectiveness of creative technologies in developing students' creative potential. The results of the study showed that the development of creative competencies has a significant positive impact on the professional formation of students. In particular, through such an approach, students began to apply their professional knowledge more effectively in practice, which made it possible to combine their theoretical training with real activities.

Also, the skills of quick and correct adaptation to new pedagogical situations were developed, they learned to make independent decisions in different conditions. In solving problems, students began to use not only traditional, but also original and creative approaches, which brought their professional skills to a new level. In addition, a positive attitude towards professional activity and the level of self-confidence significantly increased. This situation strengthened their confidence in their abilities, helped them to be active and proactive. In the process of working in a team, their skills in cooperation, exchange of ideas, and free expression of their views were strengthened.

As a result, students began to strive to work on themselves, constantly develop their knowledge and skills. Thus, the development of creative competencies not only increased the quality of professional training, but also strengthened the personal and social activity of students.

Conclusions and recommendations. Based on the results of the research, the following conclusions can be drawn:

1. Creative competencies are an integral part of the professional training of a modern specialist, they ensure the effectiveness of all components of professional activity.

2. The structural structure of creative competencies is a complex system that includes cognitive, motivational, practical, personal and reflexive components. Each of these components affects the corresponding component of professional training.

3. The mechanism of influence of creative competencies on professional training consists of the stages of creative assimilation of knowledge, creative application of skills, creative generalization of experience, creative development of personal qualities and transition to a higher integrative level of professional training.

4. The main pedagogical conditions for the development of creative competencies in students are the formation of a creative learning environment, increasing the creative and pedagogical competence of the teacher, and the use of creative technologies.

5. The results of practical research confirm that through the development of creative competencies, it is possible to significantly increase the professional training of students, especially the professional-creative and professional-psychological components. A high level of correlation was found between creative competencies and professional training.

As practical recommendations, it is important to introduce special courses and trainings aimed at developing creative competencies in higher education institutions. At the same time, it is necessary to enrich the curricula and programs and increase the share of problem-based learning, project methods and research activities. The introduction of modules aimed at developing creative and pedagogical competencies into the teacher training system, as well as the active involvement of students in research work, creative projects and startups, will also yield effective results. In addition, it is advisable to create a creative learning environment based on modern information and communication technologies and introduce creative indicators into the professional training assessment system and introduce complex assessment mechanisms.

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SCIENTIFIC-THEORETICAL ISSUES AND PEDAGOGICAL CONDITIONS OF FORMING SPEECH CULTURE IN PRIMARY STUDENTS

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Abstract. *This article studies the scientific theories and pedagogical conditions for the formation of speech culture in primary school students. The methodology for developing oral and written speech of students based on modern educational requirements is analyzed. During the study, the effectiveness of interactive methods and digital technologies in developing speech was proven through experimental work. The article also analyzes the definition of the concept of speech, the history of its emergence, and the views of Eastern scholars on the need to develop speech.*

Keywords: *speech, culture, primary school, methodology, native language, student, teacher, modern approach, pedagogy, effectiveness.*

INTRODUCTION. The main goal of the modern education system is to educate a comprehensively developed, independent and creatively thinking individual. The foundation of personal development is laid in the primary grades. The formation of a speech culture of students during this period determines their social adaptation and future academic success.

In particular, the formation of a speech culture in primary grades is an urgent issue today. Working on the correctness of speech, improving the speech culture of primary school students is one of the main directions of the teacher's educational and methodological activities [5; p. 12].

The issue of forming a speech culture has long occupied a central place in the work of Eastern thinkers. Al-Farabi says the following about speaking correctly, drawing logical conclusions, and being a meaningful and beautiful speaker: "When we come to how to give and receive education, how to express and explain thoughts, how to ask and how to answer, I affirm that the first of these sciences is the science of language, which gives names to bodies, that is, substance (independent, self-existent) and accident (accidental manifestations).

The second science is grammar: it teaches how to arrange the names given to bodies and how to construct wise sayings and discourses that express the arrangement of substance and accident and the result that follows from them.

The third science is logic: it teaches how to arrange propositions according to logical figures in order to draw certain conclusions, by means of which we learn what we do not know and judge what is true and what is false” [2;p. 54].

METHODS. The term speech is derived from the Arabic word, which means speech, speech; the ability to speak. The use of language in the processes of expressing and exchanging thoughts; the process of using language tools by the speaker and the product of this process.

As is known, the place and role of speech and thinking in human life has long interested many people. Thinkers such as Al-Farabi, Zamakhshari, Al-Biruni, Ibn Sina, Yusuf Khos Hajib, Kaykovus, Alisher Navoi noted speech in their works as one of the signs of spiritual perfection. In

particular, Al-Farabi says the following about the power of speech: "…the power of speech (speech) is such a power that with its help a person acquires knowledge and skills, with the help of which he can distinguish between ugly and beautiful actions in his behavior and perform necessary and unnecessary actions, at the same time he understands what is harmful and useful, what is pleasant and what is bitter" [2; 188-p.]. M. Kashgari's work "Devon-u lug'otit turk" contains the proverb "The beginning of morality is language." This shows how our great ancestors emphasized the importance of language in the formation and development of human spirituality. Yusuf Khos Hajib says that human intelligence and knowledge are revealed through language and words, and calls for fluent speech: "Language is the interpreter and translator of intelligence and knowledge.

Enlightenment, goodness, and virtues come to a person through language, and this should be well understood. A person finds both honor and respect through language. …Never speak too much. Speak too little. Write down a complex word with one word, that is, strive to imbue more meaning into a few words." Kaykovus in his work "Qobusnama" recognizes the culture of speech as follows: "... when speaking in front of the people, let your words be beautiful, let the people accept these words. Let the people know that you have reached a high level with your words, because they know a person's rank through words, ... everyone's situation is hidden under their words." [4]

The issue of developing the speech of primary school students is addressed in current methodological literature based on different approaches to knowledge about language, vocabulary, and speech culture.

The issue of developing students' speech in the process of teaching their native language was studied in the 30s-50s of the last century by A. Sa'diy, S. Dolimov; after the 60s by such scientists as Candidate of Pedagogical Sciences Y. Abdullaev, Doctor of Pedagogical Sciences Q. Abdullaeva, Professor K. Kasimova, B. Turdiev, A. Gulomov, M. Askarova, S. Matchonov, Sh. Yusupova, T. Ziyodova. A. Sa'diy noted the importance of oral and written descriptions of characters in teaching literature, and S. Dolimov noted the importance of written descriptions and students' speech in organizing literary creative works. In the methodological manual "Development of speech in the 1st grade" by Q. Abdullaeva, methods for teaching students to pronounce sounds and words correctly, independently organize logical exercises during literacy training, use didactic materials, and demonstration are described [1]. K. Kasimova in her book "Working on vocabulary in the 5th grade mother tongue lessons" discusses the methodology for organizing vocabulary exercises.[9] The vocabulary of the language creates great opportunities for the student's speech development to communicate with others. The teacher must teach students to use language units in different situations, to be conscious of their speech, and to feel responsible for each word they say. The mother tongue as a subject of study should not only help to master theoretical knowledge, but also to form the skills of practical application of language units that are necessary for a person throughout his life.

B. Turdiev's manual "Practical on the development of written speech" covers general theoretical issues of written speech, auxiliary written work, written work related to independent work on a book, filling out worksheets, teaching how to write statements and essays.

A. Gulomov, M. Qodirov's book "Methodology of speech development in Uzbek" gives the theoretical and practical importance of speech development, methodological recommendations for organizing exercises on speech development.

The manual "Development of speech in young children", created by a group of scientists under the leadership of M. Askarova, is mainly devoted to the study of issues of speech development in kindergarten children [3]. It is important to remember that developing the speech of preschool children is a foundation for subsequent stages of education, and that it is necessary to determine in advance the content of speech development classes, teaching methods, an individual approach to children, and the development of the speech activity of each child at all stages of the training.

The manual “Uzbek language teaching methodology” created by B. Tokhliev, M. Shamsieva, T. Ziyodova pays special attention to the methodology of developing students' speech and enriching their vocabulary in connection with grammatical topics in the preparation of future specialists for school education [6]. Various exercises that ensure the acquisition of knowledge on all subjects taught in primary school are aimed at developing students' skills in literate writing, correct pronunciation and oral speech, and enriching students' vocabulary is a prerequisite for mastering academic subjects and forming a culture of oral and written speech.

Sh. Yusupova in her monograph “Philosophical foundations of developing students' thinking in modern Uzbek literary language lessons” noted that the use of independent work types in native language education is effective in achieving practical language mastery by students [7]. Increasing students' cognitive activity, getting them interested in reading, and forming their skills for independent learning are urgent problems. It is known that, along with concepts such as cognitive activity, cognitive activity, and cognitive initiative, cognitive independence is also of great importance.

RESULTS. The grammatical knowledge and skills given to students in the primary grades, as well as the skills related to speech and spelling, are considered to be thoroughly mastered only if they are used not only in individual words and sentences, but also in logically thought-out examples presented in statements and essays. In order to form the skills of creating an independent text in a student, it is necessary to work first of all on developing his oral speech. Because the more developed the student's oral speech is, the more this is reflected in his written speech. In order for a student to describe an event, whether in writing or orally, he must have a certain level of vocabulary, be able to find words and word combinations that are appropriate to the content of the topic in order to clearly express his thoughts on a particular topic, and be able to use them in their place in speech.

The analysis of research has shown that speech knowledge and speech skills are two different phenomena. Speech knowledge is acquired on the basis of mastering knowledge of all levels of the language, while speech skills are the use of the speech system in various speech styles. During speech activity, a person pays attention not to words, but to the meaning of the word and chooses the right word to clearly express his thoughts. Speech skills are the ability to quickly adapt and plan the direction of speech, find language tools to develop the content of speech, and put them into practice.

K.D. Ushinsky noted that “the development of speech in children is almost the same as the development of logical thinking in them”. Logical thinking is formed and develops in primary school, and continues to improve throughout life. Human thought is expressed in the forms and means of language. No matter how complex the content of thought is, it can be consistently reflected with the help of syntactic constructions and morphological forms of the language. Thus, mastering the language, having a sufficient vocabulary and grammatical forms creates the basis for the development of thinking.

E. Goziev emphasizes that reality is reflected with the help of speech, and speech is one of the important properties of the psychology of thinking.

Speech is a specific form of life as a separate type of social activity in the process of expressing and exchanging ideas, and it is understood as the processes of its oral and written manifestation, that is, the process of speaking, its result. In linguistic theory, the concept of speech is contrasted with the abstract concept of language, which is a system of means of expression adopted in a particular language community, and the specific, somewhat more general concept of language, which is one of the most characteristic manifestations of social existence. Written speech differs from oral speech in that it is somewhat more structured, words are selected very carefully, grammatically clear, but complex in structure, and cannot use the intonation, facial expressions, and hand gestures characteristic of oral speech.

DISCUSSION. There are monological and dialogical types of speech, depending on the field of application, such forms as artistic speech, scientific speech, official speech. In any form and in any case, clarity, fluency, simplicity, expressiveness should remain the most important features of speech [8; p. 425]. Well-developed speech serves as one of the important tools of human activity in society. For a student, speech is a tool for successful learning at school. In order to develop speech activity and student speech, it is necessary to pay attention to the following:

1. There must be a demand for the emergence of a person’s speech.

2. Any speech must have content, material. The more complete, rich, valuable this material is, the more meaningful its presentation will be.

3. It is necessary to arm speech with language tools. It is necessary to give students language samples, create good speech conditions for them. As a result of hearing speech and using it in their own experience, children consciously form a “language perception”.

There are a number of aspects of speech acquisition. These are:

1. Mastering the norms of the literary language. The school teaches students to distinguish literary language from simple colloquial language, dialect and jargon, introduces them to artistic, scientific, colloquial variants of the literary language.

2. Mastering important speech skills necessary for every member of our society, namely reading and writing skills. In this way, students learn the features of written speech, its difference from oral-colloquial speech.

3. Improving the speech culture of students. Language is the most important means of communication in society. Based on this social significance of language, special attention is paid to the speech culture of students at school [105; p. 300].

By the time children reach the age of six, they have mastered the most important means of morphology and many forms of syntax within the framework of the style of speech. In other words, children acquire their native language through speech activity, speech reception, and speaking. Therefore, it is very important to create conditions for children's speech activity, communication, and expression of their thoughts.

Determining the set of pedagogical conditions for the formation of speech culture skills in primary school students, we were guided by the requirements of modern society for the education of the native language, the content of language education for primary school students.

Pedagogical ideas about communication, its essence, significance and role in the educational process made it possible to note the following:

a) communication in the history of domestic and foreign pedagogy is associated with a person's need for self-understanding, development of consciousness and manifestation of

independence (J. Dewey, I.G. Pestalossi, L.N. Tolstoy, K.D. Ushinsky, etc.);

b) communication is a situation of searching for the essence of values and strengthening them in experiences and actions (E.V. Bondarevskaya, Z.I. Vasilyeva, I.A. Kolesnikova, A.P. Tryapisyna, etc.);

c) communication - provides anthropocentrism, understanding and empathy, reveals the individuality of a person (R.Yu. Khudoyberganov, V. Diltey, Ye.I. Kazakova, A.G. Rivin, etc.); d) upbringing with and within culture, on the one hand, ensures a person's natural entry into social life and communication, and on the other hand, it is through communication that the assimilation of cultures occurs (T.G. Braje, I.S. Gracheva, A.V. Mudrik, etc.).

Table 1.1. Content of the components of the formation of speech culture of primary school students

Component Content	Component Content
Linguistic • knowledge of active lexical, grammatical and phonetic material;	Linguistic • knowledge of active lexical, grammatical and phonetic material;
• knowledge of the graphic system of the language;	• knowledge of the graphic system of the language;
• spelling rules, their reliance on different principles;	• spelling rules, their reliance on different principles;

The content of the components of the formation of speech culture in primary school students allows us to conclude that the following are necessary when teaching students this type of speech activity: mastering language rules, learning to use them to express one's own or others' thoughts through the means of the native language, as well as mastering the skill of using various supports to independently construct one or another written thought. In this case, the teacher's task is to create favorable conditions for the successful implementation of all components in the educational process.

Successful mastery of written and oral speech, which allows for the formation of speech culture in primary school students, requires the formation of practical skills by performing special exercises, ensuring the combination of traditional and interactive methods.

The main task of primary school native language classes is to prepare students for educational activities, to form a person who can communicate with others, and to convey his thoughts to others in an understandable way.

The content of the subject "Mother Language" for the formation of personal speech culture in primary school students includes three components: linguistic, psychological and methodological.

CONCLUSION. The formation of speech culture in primary school students is not just a literacy lesson, but a strategic pedagogical process that determines the spiritual and intellectual future of the nation. The language of a child of primary school age is like soft wax that is just being formed; whatever shape it is given, the person will be formed in the future.

The results of our research clearly show that in order to successfully form a speech culture, it is necessary to transform the educational process from a dry set of rules into a lively, creative and

communicative field. The teacher's high speech example, innovative speech situations used in lessons, and the child's freedom of thought are the main pedagogical conditions for raising an excellent speaker. Raising a generation whose speech is beautiful, whose thoughts are deep, and who is proud of the rich possibilities of their native language is the highest and most undeniable goal of primary education.

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THE SIGNIFICANCE OF INTERACTIVE METHODS IN DEVELOPING THE DIGITAL COMPETENCIES OF FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *This article analyses the theoretical foundations and practical significance of interactive methods in forming and developing the digital competencies of future primary school teachers. Digital competence is treated as a structural criterion of a teacher's professional readiness, and its componential structure — information retrieval and analysis, digital resource creation, media literacy, virtual collaboration and online safety — is examined in detail. The pedagogical effectiveness of "Brainstorming," "Cluster," "Case-study," the project method and "Blended learning" is justified from constructivist and activity-based perspectives. The paper presents a conceptual model integrating interactive methods with digital technologies and an analytical table mapping each method onto specific competence components. It concludes that effective professional preparation requires deploying these methods not in isolation but as a didactically grounded, mutually complementary system.*

Keywords: *digital competence, interactive methods, primary education, pedagogical technologies, information and communication technologies, innovative education, blended learning.*

1. INTRODUCTION

Processes of globalisation and digital transformation are placing qualitatively new demands on education systems. Today, the effectiveness of a teacher's work is determined not only by deep knowledge of subject content, but also by the ability to use information and communication technologies (ICT) consciously, safely and in accordance with pedagogical aims. This is especially significant for primary education, which is the foundational stage at which learners' first knowledge, skills and competencies are formed; consequently, the digital readiness of teachers working at this level acquires strategic importance.

Digital competence has become an integral component of a teacher's professional competence. It encompasses the skills of searching, evaluating, processing, storing and transmitting information, as well as designing and managing the educational process through digital platforms. From this perspective, the consistent formation of this competence among future primary school teachers in higher pedagogical institutions constitutes a pressing scholarly and practical task.

This task is especially relevant in the context of ongoing education reforms in Uzbekistan, which prioritise competency-based and learner-centred approaches, the modernisation of teacher-training curricula and the wider introduction of digital tools into the educational process. Within these reforms, the digital preparation of future teachers is regarded not as a supplementary skill but as a core element of professional qualification. At the same time, practice shows that the gap between teachers' declared digital knowledge and their actual ability to apply it in the classroom

remains considerable, which underlines the need for activity-based forms of preparation rather than purely theoretical instruction.

However, digital competence cannot be fully formed through traditional, lecture-based instruction, because such competence is by its nature activity-oriented and practical. For precisely this reason, interactive methods — teaching approaches grounded in active interaction between teacher and student and among students themselves — emerge as one of the most effective means of developing digital competence. The aim of this article is to provide a theoretical justification of the role of interactive methods in developing the digital competencies of future primary school teachers and to systematically analyse the correspondence between these methods and the components of digital competence.

2. THE CONCEPT OF DIGITAL COMPETENCE AND ITS COMPONENTIAL STRUCTURE

Digital competence is the capacity of an individual to use information and communication technologies in a conscious, effective, critical and safe manner. Internationally, this concept has been systematised in educational frameworks developed by UNESCO and the European Commission — notably DigCompEdu, the digital competence framework for educators — which divide a teacher's digital activity into several interrelated areas. Drawing on this international experience, the digital competence of a future primary school teacher can be expressed through the following components:

- searching for, evaluating and analysing digital information;
- creating electronic learning resources (presentations, tests, interactive materials);
- using multimedia and visualisation tools for didactic purposes;
- working with distance and blended learning platforms;
- observing the rules of media literacy and information security;
- organising collaboration and professional communication in virtual environments.

These components do not develop in isolation but as an integrated system. Their particular character for a primary school teacher lies in the requirement that digital tools be applied in accordance with the principles of play, visuality and activity, taking into account the developmental and psychological characteristics of young learners. Digital competence is therefore not merely a technical skill, but one that also presupposes the capacity for didactic and methodological reasoning.

3. THE PEDAGOGICAL AND THEORETICAL FOUNDATIONS OF INTERACTIVE METHODS

Interactive methods are closely connected in contemporary educational theory with constructivist and activity-based approaches. From a constructivist standpoint, knowledge is not transmitted ready-made but is constructed by the learner in the course of active engagement. According to L. S. Vygotsky's sociocultural theory, knowledge is first assimilated at the level of social interaction and only afterwards at the individual level; the notion of the "zone of proximal development" highlights the developmental significance of collaboration with peers and the teacher. Interactive methods organise precisely this collaborative space and are therefore a theoretically well-founded means of forming digital competence.

The principal aim of interactive methods is to transform the student from a passive listener into an active subject of the educational process. These methods offer the following pedagogical advantages: they develop independent and critical thinking; they encourage a creative approach; they cultivate teamwork and communicative skills; they support the analysis of problem situations;

and they enrich practical experience of working with digital technologies. When integrated with digital tools, interactive methods yield a "double" effect: the student simultaneously masters both the subject content and the digital tools required to convey it.

The following conceptual model summarises, in generalised form, the relationship between interactive methods, the stage of pedagogical mediation, and the components of digital competence (Figure 1).

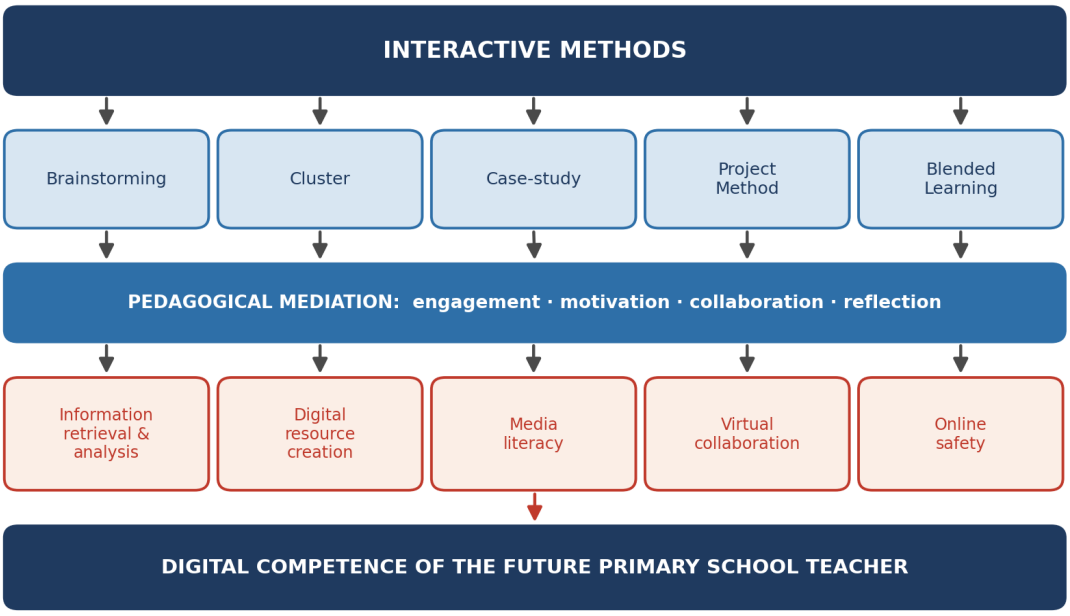


Figure 1. A conceptual model of developing digital competence through interactive methods

4. INTERACTIVE METHODS FOR DEVELOPING DIGITAL COMPETENCE

4.1. The "Brainstorming" method

The "Brainstorming" method encourages students to put forward ideas freely and without criticism, and it develops divergent thinking. When organised in a digital environment — for example, using an interactive whiteboard or online idea-sharing platforms — students' ideas are collected, grouped and visualised in real time. For instance, a brainstorming session on the topic "The advantages of using multimedia tools in primary classes" simultaneously develops in students both idea generation and the skill of working with a digital tool.

4.2. The "Cluster" method

The cluster method serves to systematise information, identify the logical relationships among concepts and represent them in graphical form. When implemented through digital tools — online diagram and concept-mapping platforms — students not only organise information but also acquire the skill of digital visualisation. This directly reinforces the components of media literacy and information analysis.

4.3. The "Case-study" method

The case-study method is based on the analysis of real or realistic pedagogical situations. Students are presented, for example, with a problem situation arising from the use of a digital tool in a primary lesson, and they develop, justify and defend solution options. This method develops the skills of professional decision-making, critical reasoning and didactic analysis, thereby forming the practical and reflective dimension of digital competence.

4.4. The project method

The project method organises the student's independent, goal-directed and product-oriented activity. Through creating electronic presentations, short video lessons or interactive didactic games, students demonstrate their digital competencies in an integrated manner. During the project, the stages of planning, resource creation, presentation and self-assessment simultaneously activate several components of digital competence.

4.5. The "Blended learning" technology

Blended learning is a model that combines traditional classroom instruction with online learning. It develops in students the skills of working on distance platforms, using electronic resources independently and managing their own learning trajectory. Platforms such as Google Classroom, Moodle, Zoom and Microsoft Teams serve as the principal technological environment here and reinforce the digital culture of the future teacher.

5. ANALYSIS OF THE CORRESPONDENCE BETWEEN METHODS AND COMPETENCE COMPONENTS

In order to examine systematically the effect of the methods described above on the components of digital competence, the following analytical table was constructed (Table 1). The table summarises, for each method, the components it predominantly develops together with its principal digital tools.

Table 1. Correspondence between interactive methods and components of digital competence

Method	Principal didactic aim	Competence component developed	Digital tools
Brainstorming	Idea generation; divergent thinking	Information retrieval; virtual collaboration	Interactive whiteboard, online idea platforms
Cluster	Systematising and visualising information	Information analysis; media literacy	Concept-mapping, diagram platforms
Case-study	Analysing and solving problem situations	Critical reasoning; decision-making	Digital case bases, online discussion
Project method	Independent, product-oriented activity	Digital resource creation; integration	Presentation, video, interactive-game tools
Blended learning	Combining traditional and online learning	Platform use; online safety	Google Classroom, Moodle, Zoom, Teams

Analysis of the table shows that no single method covers all components of digital competence to the same degree; rather, each method predominantly develops a particular set of components. It follows that effective professional preparation requires applying the methods not in isolation, but as a mutually complementary system — that is, in a didactically grounded combination.

6. DISCUSSION: THE EFFECTIVENESS OF INTERACTIVE METHODS

Pedagogical observation and experience indicate that, in lessons employing interactive methods, students' levels of engagement and attainment are higher than in traditional classes. This can be explained from a motivational standpoint: active participation, the creation of a real product and seeing one's own result increase the student's intrinsic interest. Interactive methods integrated with ICT yield, in particular, the following outcomes: students' ICT skills develop; interest in lessons grows; the capacity for independent learning is formed; communicative competencies are strengthened; and innovative and critical thinking is enhanced.

At the same time, applying interactive methods requires adherence to a number of methodological conditions. First, the choice of method must correspond to the learning objective and the targeted competence component — technology is not an end in itself but a didactic means. Second, the teacher must act as a facilitator, guiding students' activity. Third, the reflection stage — in which the student reasons about their own activity and the digital tool they have used — is decisive for the stable formation of competence. When these conditions are not met, the use of digital tools may become superficial and fail to produce the expected developmental effect.

It is also important to acknowledge the practical constraints that may limit the effectiveness of these methods. Large class sizes, uneven access to devices and stable internet connectivity, and the time required to design interactive digital tasks can all reduce the feasibility of regular implementation. Furthermore, the success of interactive methods depends heavily on the teacher-educator's own digital competence: instructors who model effective digital practice transmit not only techniques but also professional attitudes and a digital culture. These considerations suggest that the development of future teachers' digital competence is a systemic matter, requiring coordinated attention to curricula, infrastructure and the continuous professional development of teacher-educators themselves.

The theoretical contribution of this study lies in linking digital competence to a system of interactive methods at the level of components, thereby identifying the precise didactic place of each method. In practical terms, the model and table presented here can serve as a methodological reference in designing instruction in higher pedagogical institutions. As a limitation of the study, it should be noted that the considerations of effectiveness presented here rest principally on qualitative observation and a review of the literature; in future research it would be appropriate to confirm these conclusions statistically through a quantitative experiment involving control and experimental groups.

7. CONCLUSION

In conclusion, developing the digital competencies of future primary school teachers is one of the priority tasks of the contemporary education system. The findings of this study show that interactive methods — "Brainstorming," "Cluster," "Case-study," the project method and "Blended learning" — serve to form the various components of this competence in a consistent and mutually complementary manner.

An educational process organised on the basis of interactive methods and integrated with digital technologies encourages students to participate actively, forms in them innovative and critical thinking, and ensures practical preparation for their future professional activity. Accordingly, the systematic integration of interactive methods with digital technologies in higher pedagogical institutions — applying each method with regard to its didactic role and strengthening the reflective component — is of considerable pedagogical importance.

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PEDAGOGICAL BASIS OF DEVELOPING PHYSICAL QUALITIES IN STUDENTS THROUGH MINI-FOOTBALL TRAINING

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Abstract. *The article presents an academic analysis of the pedagogical basis for developing students' physical qualities through mini-football training in higher education. The study is organized as a theoretical-methodological inquiry and synthesizes principles of physical education, sports-game methodology, and pedagogical control. Its purpose is to justify mini-football as an effective educational means for improving speed, endurance, agility, coordination, speed-strength ability, teamwork, and responsible participation. The Methods section describes the analytical procedure used to classify the physical qualities targeted by mini-football, to identify pedagogical requirements for training organization, and to formulate criteria for monitoring student progress. The Results section proposes an integrated model of mini-football training that includes preparatory, main, and final stages, gradual workload progression, individualization, and formative evaluation. The Discussion emphasizes that the pedagogical value of mini-football lies not only in motor development but also in its contribution to students' motivation, self-regulation, social cooperation, and readiness for a healthy lifestyle. The article concludes that mini-football can be systematically integrated into university physical education as a scientifically grounded and practically accessible training tool.*

Keywords: *mini-football; physical education; physical qualities; sports games; pedagogical technology; student development; training methodology; pedagogical control.*

1. Introduction

The modernization of higher education requires a balanced approach to student development in which intellectual growth, physical preparedness, psychological resilience, and social responsibility are treated as mutually connected educational outcomes. In this regard, physical education cannot be reduced to the mechanical performance of exercises; it should be understood as a purposeful pedagogical process that develops students' motor abilities, health culture, discipline, cooperation, and readiness for active participation in social and professional life. The national and pedagogical significance of physical culture is also reflected in the legal and methodological framework of physical education and sport, where health promotion and systematic engagement in sport are recognized as important components of social development (Republic of Uzbekistan, 2015; Salomov, 2015).

Sports games occupy a special place in university physical education because they combine physical load with situational decision-making, emotional involvement, interaction, and competition. Among these games, mini-football is particularly valuable for students because it is dynamic, accessible, popular, and pedagogically flexible. The small playing area, frequent changes of direction, repeated accelerations, ball-control actions, and continuous cooperation between players create a training environment in which several physical qualities can be developed

simultaneously. In addition, the game format naturally increases motivation, which is one of the major conditions for stable participation in physical education activities.

The relevance of mini-football training is determined by the fact that many students need forms of physical activity that are both health-promoting and emotionally attractive. Traditional exercise systems may develop separate physical abilities, but they do not always provide the communicative, tactical, and motivational conditions that sports games offer. Mini-football allows the teacher to organize physical load through meaningful game situations. As a result, students do not merely repeat isolated movements; they learn to move, think, cooperate, and respond to changing conditions at the same time.

From a pedagogical perspective, mini-football training has a dual function. First, it contributes directly to the development of speed, endurance, agility, coordination, and speed-strength qualities. Second, it shapes socio-psychological qualities such as teamwork, responsibility, discipline, rapid decision-making, self-control, and respect for rules. These features make mini-football a valuable pedagogical technology within the broader system of university physical education (Matkarimov, 2018; Xo'jayev, 2020).

The purpose of this article is to academically substantiate the pedagogical basis of developing physical qualities in students through mini-football training. The article addresses the following research-oriented tasks: to clarify the pedagogical essence of mini-football training; to identify the main physical qualities developed through mini-football; to propose a methodologically grounded structure for organizing training sessions; and to define the role of pedagogical control and evaluation in improving the effectiveness of this process.

2. Materials and Methods

This article is designed as a theoretical and methodological study rather than an experimental intervention. Its analytical basis consists of pedagogical principles of physical education, methodological approaches to sports games, and the practical logic of mini-football training. The study uses conceptual analysis, pedagogical modelling, and comparative synthesis to determine how mini-football can be organized as a means of developing students' physical qualities in higher education.

The material for the analysis includes the core concepts of physical education theory, methodological recommendations on sports-game training, and the pedagogical characteristics of mini-football. The study focuses on higher education students as the target group because this age group requires training activities that combine health improvement, motor development, motivation, and social interaction. Mini-football is examined not simply as a competitive sport but as a structured pedagogical tool that can be adapted to the educational conditions of university physical education classes.

The methodological procedure consisted of four stages. At the first stage, the educational potential of mini-football was analyzed in relation to the general aims of physical education. At the second stage, the physical qualities most directly developed through mini-football were classified. At the third stage, the structure of a training session was modelled according to pedagogical principles such as systematicity, consistency, accessibility, individualization, gradual workload progression, and safety. At the fourth stage, criteria for pedagogical control and evaluation were formulated in order to ensure that training outcomes can be observed and adjusted during the educational process.

The main analytical criteria were: the relationship between game actions and physical qualities; the correspondence between training load and students' individual capacities; the

developmental value of technical-tactical exercises; the role of teacher supervision in preventing excessive strain and injury; and the contribution of fair evaluation to students' motivation and self-assessment. This methodological framework makes it possible to interpret mini-football training as a purposeful educational system rather than a spontaneous game activity.

Table 1. Analytical framework for studying mini-football as a pedagogical tool

Analytical component	Pedagogical focus	Expected educational function
Training content	Technical-tactical exercises, game situations, ball-control actions	Development of motor activity through meaningful practice
Physical qualities	Speed, endurance, agility, coordination, and speed-strength abilities	Comprehensive improvement of students' physical preparedness
Pedagogical principles	Systematicity, gradual progression, individualization, accessibility, and safety	Scientific organization of training and prevention of overexertion
Control and assessment	Observation, testing, feedback, and self-assessment	Monitoring of progress and correction of training methods
Personal development	Teamwork, discipline, responsibility, motivation, and emotional stability	Formation of socially valuable qualities through sport

3. Results

The analysis shows that mini-football has considerable pedagogical potential because its game structure naturally integrates several types of physical and psychological activity. Unlike isolated exercises, mini-football requires students to accelerate, stop, turn, coordinate body movement with ball control, maintain attention, cooperate with teammates, and respond to opponents' actions. Consequently, each training session can influence several physical qualities at the same time.

The first major result of the analysis is the identification of speed as one of the central qualities developed through mini-football. The game frequently requires short-distance acceleration, rapid transition from defense to attack, and quick reaction to ball movement. These actions develop not only running speed but also perceptual speed and decision-making speed. In pedagogical terms, this means that exercises should include starts, sprints, reaction tasks, one-on-one situations, and small-sided games in which students must quickly choose an appropriate tactical action.

The second result concerns endurance. Although mini-football is played in short and intense episodes, students remain in almost continuous movement throughout the game. Repeated accelerations, defensive movements, pressing, recovery runs, and ball circulation contribute to the development of both general and specific endurance. Properly planned training can strengthen the functional capacities of the cardiovascular and respiratory systems. However, this requires gradual progression of workload and careful monitoring of fatigue, especially among students with different levels of physical preparedness.

The third result is related to agility and coordination. Mini-football contains frequent changes of direction, feints, stops, turns, passes, ball reception, and shooting movements. These actions develop coordination because the student must control body position, footwork, visual perception, and ball movement simultaneously. Agility is developed through rapid adaptation to changing game conditions. Therefore, exercises with the ball are particularly effective because they combine motor precision with situational awareness.

The fourth result concerns strength and speed-strength ability. Mini-football does not primarily develop maximal strength; rather, it develops functional strength expressed in acceleration, jumping, balance maintenance, quick stops, body control, and changes of direction. Such movements activate the muscles of the lower limbs, trunk, and stabilizing systems. From a pedagogical standpoint, strength development should be integrated into game-like exercises rather than organized only as separate strength training, especially in general university physical education classes.

The fifth result is that mini-football training contributes to teamwork, responsibility, and discipline. Students learn to follow rules, coordinate their actions with others, support teammates, and make decisions under time pressure. These social and psychological outcomes are important because physical education in higher education should contribute not only to biological development but also to the formation of personal qualities that are relevant to future professional activity.

Table 2. Physical qualities developed through mini-football training

Physical quality	**Mini-football actions**	**Pedagogical means**	**Expected outcome**
Speed	Short accelerations, quick reactions, transitions	Starts, sprint drills, reaction games, small-sided attacks	Faster movement and quicker tactical response
Endurance	Continuous movement, pressing, repeated recovery runs	Interval game tasks, controlled playing time, progressive workload	Improved general and sport-specific endurance
Agility	Turns, feints, changes of direction, defensive shifts	Cone tasks, dribbling routes, one-on-one situations	Better adaptation to changing game conditions
Coordination	Passing, receiving, shooting, ball control under pressure	Ball exercises, paired tasks, technical-tactical combinations	Improved movement accuracy and body-ball coordination
Speed-strength ability	Jumping, stopping, acceleration, body control	Game-like power tasks, quick starts, directional changes	Stronger functional movement capacity

4. Organization of Mini-Football Training

The effective organization of mini-football training requires adherence to general pedagogical principles and to the specific logic of sports-game methodology. The principle of systematicity means that training should not be occasional or random; it should be planned according to clear objectives, repeated practice, and gradual complexity. The principle of

consistency requires a logical sequence from simple to complex, from individual technical actions to group interaction, and from low-intensity tasks to more demanding game situations.

The principle of individualization is especially important in higher education because students often differ significantly in physical fitness, technical experience, motivation, and health status. The teacher should therefore adapt the intensity, duration, and complexity of exercises to students' capacities. This does not mean separating students completely; rather, it means using differentiated tasks, flexible grouping, and alternative levels of difficulty within the same training session. Such an approach makes the process inclusive and reduces the risk of overexertion.

A mini-football training session should generally include three interrelated parts: the preparatory part, the main part, and the final part. The preparatory part includes general and special warm-up exercises intended to prepare the musculoskeletal, cardiovascular, and nervous systems for subsequent activity. In mini-football, the warm-up should include mobility, coordination, light running, ball touches, and simple passing tasks. The main part includes the central technical, tactical, and game-based tasks of the lesson. The final part includes recovery exercises, breathing regulation, stretching, brief reflection, and pedagogical feedback.

The content of the main part should be selected according to the specific physical quality that the teacher intends to develop. For example, if speed is the priority, the lesson should include short explosive actions and reaction tasks. If endurance is the priority, the lesson may include interval game episodes with controlled rest. If agility and coordination are the main objectives, exercises should include ball control under changing spatial and tactical conditions. This objective-based organization increases the methodological clarity of the training process.

Table 3. Recommended structure of a mini-football training session

Stage	Approximate content	Pedagogical purpose	Teacher control
Preparatory part	General warm-up, mobility, light running, ball touches, simple passing	Physiological and psychological preparation for activity	Check readiness, technique safety, and initial fatigue signs
Main part	Technical drills, tactical tasks, small-sided games, conditioned play	Development of targeted physical qualities and game competence	Regulate load, correct technique, organize feedback
Final part	Recovery running, breathing, stretching, reflection, analysis	Restoration and consolidation of learning outcomes	Assess participation, note progress, give individual recommendations

5. Pedagogical Control and Evaluation

Pedagogical control is a necessary condition for the effectiveness of mini-football training because it allows the teacher to determine whether the training load corresponds to students' physical condition, educational objectives, and safety requirements. Control should not be limited to final grading; it should function as a continuous process of observation, feedback, adjustment, and encouragement. Through pedagogical supervision, the teacher can identify changes in students' physical preparedness, technical-tactical mastery, and functional capacity.

A comprehensive evaluation system should include both objective and formative indicators. Objective indicators may include speed tests over short distances, endurance tasks, agility drills, coordination exercises with the ball, and observation of technical execution during play. Formative indicators may include participation, effort, discipline, cooperation, tactical awareness, and ability to evaluate one's own progress. Such a combination ensures that assessment reflects not only physical performance but also the broader educational aims of physical education.

Fair and transparent assessment has an important motivational function. When students understand the criteria of evaluation, they become more responsible for their own development and more willing to participate actively. Assessment also helps students compare their current level with previous results, which supports self-analysis and goal setting. Therefore, pedagogical control should be constructive rather than punitive; it should help students understand how to improve and how to maintain safe, consistent progress.

The results of control should be used to adjust the content and intensity of subsequent training sessions. If students demonstrate signs of excessive fatigue or insufficient technical control, the teacher should reduce the load, simplify tasks, or increase recovery time. If students demonstrate stable progress, the teacher may gradually increase complexity through more demanding tactical conditions, faster tempo, or longer game episodes. This feedback-based organization reflects the principles of scientificity and systematicity in physical education (Salomov, 2015).

6. Discussion

The findings of the theoretical-methodological analysis confirm that mini-football is pedagogically valuable because it unites physical, cognitive, emotional, and social dimensions of student development. The game does not merely strengthen the body; it teaches students to act in changing situations, to cooperate, to respect rules, and to regulate their own behavior. These features correspond to the broader educational mission of physical education in higher education, where the aim is not only to improve physical fitness but also to support the formation of a healthy and socially responsible personality.

The dynamic nature of mini-football explains its effectiveness for developing several physical qualities simultaneously. Speed is developed through acceleration and reaction; endurance through repeated movement and active participation; agility through rapid changes of direction; coordination through technical actions with the ball; and speed-strength ability through jumping, stopping, and explosive movement. This multidimensional effect makes mini-football more pedagogically efficient than exercises that target only one isolated motor ability.

At the same time, the educational effect of mini-football depends on the quality of pedagogical organization. If the training process is reduced to uncontrolled play, the developmental potential of mini-football may not be fully realized. Effective training requires clear objectives, progressive workload, structured exercises, teacher feedback, safety rules, and systematic evaluation. Therefore, mini-football should be treated as a pedagogically organized activity rather than simply as recreational sport.

Another important implication is that mini-football can increase students' motivation toward physical education. Because many students perceive game-based activities as emotionally engaging, mini-football can help overcome passivity and low interest in traditional physical training. This motivational advantage is important for forming a stable need for a healthy lifestyle. When students experience physical education as meaningful, cooperative, and enjoyable, they are more likely to continue physical activity beyond compulsory classes.

The limitations of the present article should also be noted. Since the study is theoretical and methodological, it does not provide experimental measurements of changes in students' physical qualities. Future empirical research may test the proposed model through pre-test and post-test designs, compare mini-football training with other sports-game methods, and examine gender, fitness level, and motivation as variables influencing training outcomes. Nevertheless, the conceptual framework presented here can serve as a basis for designing such experimental studies.

7. Conclusion

Mini-football training is an effective pedagogical means for developing students' physical qualities in higher education. Its dynamic structure, repeated movement actions, technical-tactical richness, and competitive environment create favorable conditions for the development of speed, endurance, agility, coordination, and speed-strength abilities. At the same time, mini-football contributes to psychological stability, willpower, discipline, teamwork, responsibility, and positive motivation toward sport.

The effectiveness of mini-football training depends on scientifically grounded organization. Training should be structured according to preparatory, main, and final stages; workload should increase gradually; tasks should correspond to students' individual capabilities; and pedagogical control should be used continuously to monitor progress and prevent excessive strain. Fair assessment and constructive feedback help students understand their own development and strengthen their responsibility for self-improvement.

The systematic integration of mini-football into university physical education can improve students' interest in sport, support meaningful leisure, and contribute to the formation of a healthy lifestyle. In this sense, mini-football is not only a sports activity but also an educational technology that prepares students physically, psychologically, and socially for future professional and personal life.

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PEDAGOGICAL MECHANISMS FOR DEVELOPING LOGICAL THINKING COMPETENCE IN FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *This article explores the theoretical and methodological aspects of fostering logical thinking among future primary school teachers. The research emphasizes the importance of logical thinking as a key component of pedagogical competence and professional development. It analyzes the essential characteristics, functions, and stages of logical thinking formation within teacher education programs. The study focuses on the effective use of innovative educational technologies, interactive instructional strategies, and inquiry-based learning methods that support the development of analytical, reflective, and problem-solving abilities. Furthermore, the article identifies pedagogical factors that facilitate the enhancement of logical thinking skills and offers practical recommendations for improving the quality of teacher preparation. The findings indicate that the purposeful integration of logical thinking development into the educational process contributes to the formation of highly competent and professionally prepared primary school teachers.*

Keywords: *logical thinking development, future primary school teachers, pedagogical competence, teacher education, analytical thinking, reflective thinking, problem-solving skills, innovative educational technologies, interactive learning, inquiry-based learning, professional training, educational effectiveness, pedagogical methodology.*

INTRODUCTION

At the present stage of global educational development, improving academic quality in higher education institutions and training highly qualified, competitive specialists for the labor market have become issues of significant epistemological and institutional importance. In the international education framework adopted by UNESCO for the period up to 2030, education is recognized as a strategic driver of socio-cultural development, and ensuring access to quality learning opportunities throughout life is identified as one of its fundamental objectives. This framework emphasizes several key priorities for guaranteeing high-quality education, including equipping teachers with modern knowledge and professional competencies, developing curricula that meet national and international standards, and integrating information and communication technologies into the educational system.

LITERATURE REVIEW AND METHODOLOGY

The sociological aspect of thinking-related research is characterized by the analysis of the historical development of human thought in close connection with the social structures of different societies. This process focuses on the genesis of thinking, its relationship with social conditions, and its formation under the influence of cultural and conceptual factors. Physiology, in turn, investigates the cognitive and neurobiological mechanisms underlying thinking, aiming to identify

the relationship between thought processes, neural impulses, and brain activity. In cybernetics, human thinking is interpreted as an encoded informational flow generated during activity; that is, thinking is regarded as a mechanism for processing information and making optimal decisions.

Psychology studies thinking as a component of cognitive activity and distinguishes various forms of thinking according to the nature of the tools employed, the degree of generalization involved, and the way new knowledge is acquired by an individual. By analyzing the individual, social, and cultural dimensions of thought, psychological research contributes to a deeper understanding of human thinking processes.

Abu Ali Ibn Sina (Avicenna) presented valuable ideas regarding thinking and reasoning in his work *Danishnama*. He examined thinking as a psychological phenomenon and analyzed it as a logical form in works such as *Commentary on Aristotle's Metaphysics* and *On Interpretation*. The scholar described the structure of judgment as consisting of a logical subject, a logical predicate, and a logical connector. Furthermore, Ibn Sina analyzed concepts as components of judgment and paid particular attention to the logical relationships between universal and individual concepts.

From this perspective, research on thinking is increasingly conducted through a multidisciplinary approach, creating opportunities for a comprehensive investigation of the sociological, physiological, cybernetic, and psychological foundations of thought.

The analysis of scientific and pedagogical literature has demonstrated that the problem of intellectual and logical thinking among teachers, particularly within the formal educational processes involving prospective primary school teachers, has not yet been sufficiently studied on a scientific basis. At a time when substantial reforms are taking place in the educational system of our country, there is an increasing demand among university instructors for scientifically grounded recommendations regarding this issue.

It is well known that human beings possess the capacity for thinking and organize, regulate, and manage their behavior, life activities, and lifestyles on the basis of this ability. These processes do not occur randomly; rather, they proceed according to specific logical laws. Individuals acquire an understanding of these principles and develop the skills to apply them correctly through the study of logic.

Knowledge of logic enhances a person's thinking abilities, develops the capacity for precise and consistent reasoning, helps prevent errors in one's own judgments and those of others, and enables individuals to identify and correct such errors when they occur. This demonstrates that logic is relevant to all spheres of human activity, including pedagogical practice.

Recent transformations in higher education and social development have led to significant changes in the components of education. Consequently, revisiting educational philosophy, principles, and educational challenges through logical and innovative approaches has become a necessity of the modern era.

Given that this issue has not yet been comprehensively investigated within the framework of fundamental research and that methodological support in this field remains insufficient, our pedagogical observations and professional experience suggest that prospective teachers must possess key competencies necessary for professional competitiveness. In our view, every future primary school teacher should demonstrate:

- Intellectual and creative initiative;
- Broad and profound professional knowledge;
- Logical thinking and intellectual abilities;
- Creative and cognitive readiness to respond to various contradictions and challenges;

- The ability to present creative ideas in a logical sequence and evaluate them through logical reasoning;
- A commitment to innovation and continuous improvement;
- The ability to compare personal experiences with those of others in order to recognize personal strengths, weaknesses, and achievements;
- Awareness of personal creative potential;
- The ability to express oneself and readiness to implement innovations in practice;
- The capacity to work continuously on self-development and to select the most appropriate educational strategies for designing the teaching and learning process.

RESULTS

The implementation of a logic competency-based approach in pedagogical education contributes to achieving its primary objective, namely, supporting primary school pupils through pedagogical guidance and creating opportunities for the development of their latent intellectual abilities, including intelligence, speech fluency, and logical reasoning.

For this reason, analyzing and evaluating pedagogical innovations introduced by teachers, creating favorable conditions for their successful development and implementation, and enhancing the competitiveness of educational institutions within market-oriented educational systems have become important priorities for pedagogical teams and methodological service leaders. In this context, the establishment of new types of educational institutions, including non-governmental educational organizations, represents a significant direction of educational development. Innovative activity may be interpreted both as a personal characteristic and as the process and outcome of creative activity.

It should be noted that the development of logical thinking abilities among future primary school teachers through modern methodological approaches constitutes an integral part of the educational and social activities of higher education institutions. The incorporation of logical and methodological emphasis within this process creates an open, dynamic, and democratic environment for the formation of future teachers' professional identity and pedagogical image.

If educators aim to achieve greater effectiveness in applying creative teaching methods and strategies—namely, organizing broad and creative thinking processes—they must instill these values in future primary school teachers and encourage them to perform their professional duties consciously and responsibly. Furthermore, only within an environment characterized by logical content and structure can future primary school teachers understand the essence of the topics they study, recognize relationships among educational information, and engage in meaningful reflection.

Within system-oriented research, innovative activity is revealed through the analysis of personal, managerial-communicative, and result-oriented subsystems of the logical paradigm. The innovative potential of an individual depends on the ability to generate new ideas and concepts and, most importantly, to design and model them in practical forms. Such potential is associated with openness to novelty, intellectual flexibility, cultural and aesthetic development, educational attainment, readiness for self-improvement, and the presence of a developed innovative consciousness characterized by innovative needs, values, and motivations.

Logical thinking determines a model of excellence and its fundamental values within pedagogical practice through skills such as reasoning, creative flexibility, and optimized decision-making. This methodological approach is reflected in teaching processes, communication styles, self-awareness practices, and reflective thinking processes.

Research within the framework of logical thinking is associated with studying the structural characteristics of pedagogical activity, analyzing the developmental dynamics of thinking components, and identifying individual methodological strategies employed by teachers. In addition, the compatibility of logical thinking processes with international educational experiences, the classification of innovative educational models, and their implementation within educational practice occupy an important place in pedagogical research.

The formation of logical thinking skills is characterized by the ability to generate alternative solutions to various events and phenomena, optimize them on a scientific basis, and implement the resulting outcomes in real-life situations. Achieving a mature level of logical thinking represents a significant competence for future specialists and includes two essential dimensions in the management of primary school students during educational activities:

1. Logical analysis of available alternatives and the implementation of well-founded decisions.
2. Improvement of educational effectiveness while considering the interests of all stakeholders involved in the educational process, including teachers, students, parents, and self-governing educational structures.

DISCUSSION

Thus, the integration of logical thinking and reflective approaches in the development of innovative educational strategies contributes to the intellectual and methodological advancement of the contemporary educational environment.

In pedagogical activity, a teacher's professional individuality may manifest itself in several forms:

- Individual differences reflected episodically or partially in professional activity and behavior;
- Generalized methods and approaches to professional practice that remain stable over time and are formed based on didactic principles;
- The uniqueness, originality, and professional worldview of the teacher, as well as the expression of pedagogical perspectives that shape individuality within professional practice.

Logical thinking shapes this individuality from two primary perspectives: understanding reality through individualism and creative thinking, and achieving a mature level of self-awareness. In this regard, the following psychological factors play a decisive role:

- Awareness of one's uniqueness and recognition of characteristics that distinguish an individual from others;
- Self-expression and the formation of ideas through creative thinking processes;
- Integrity and harmony of intellectual individuality, strengthening the internal logical structure of thought;
- The dynamics of self-development and the continuity, flexibility, and logical progression of professional growth;
- Awareness of personal professional competence and evaluation of individual achievements;
- Realization of creative potential and analysis of processes related to social and professional self-actualization.

A teacher's innovative activity consists of functional components, criteria, levels, and structural elements. The harmonious integration of these factors within modern educational processes leads to higher effectiveness and quality outcomes.

In this regard, the development of logical thinking competence among future teachers requires consideration of contemporary educational standards and textbook requirements. Effective utilization of scientific and technological achievements, as well as constructive aspects of didactic methods, is of particular importance.

The pedagogical significance of targeted tasks cannot be underestimated. An analysis of scientific and methodological literature demonstrates that the concept of "logical thinking" has become a matter of social necessity in contemporary educational discourse, and its scientific foundations have been thoroughly investigated and substantiated.

These approaches create opportunities for developing innovative educational models, establishing individual teaching methodologies based on pedagogical logic and reflection, and integrating contemporary educational concepts into pedagogical practice.

Observations indicate that the methodological preparedness of future teachers for improving logical thinking skills is characterized by several developmental criteria, including:

- The ability to identify essential and primary ideas while comprehending educational materials;
- Acquisition of fundamental knowledge related to analysis, synthesis, analogy, and forecasting;
- Development of intellectual curiosity and readiness for independent life;
- Enhancement of students' intellectual capacities and the formation of a culture of discussion and debate.

Furthermore, current scientific conditions necessitate consideration of the essence of pedagogical modeling in developing models and software support systems aimed at enhancing professional and intellectual competence among future teachers through logical approaches and interactive pedagogical technologies. Bibliographic analysis reveals that existing studies primarily focus on learner-centered approaches, dual education, classifications of pedagogical technologies, and the development of professional competence under integrative, creative, and cognitive conditions. However, no specific functional pedagogical algorithm has yet been developed to address logical thinking and pedagogical reasoning comprehensively, which confirms the scientific relevance and practical necessity of further research in this area. Considering the existing conditions and the urgency of the issue, the development of a pedagogical framework for methodological enhancement of logical thinking and the creation of a comprehensive model that integrates pedagogical professional thinking competencies are regarded as important scientific tasks. Such a model would support future primary school teachers in fostering profound intellectual development among their students.

It should also be emphasized that the creative adaptation of advanced educational experiences and their integration into national educational practice constitute a major objective of pedagogical science and educational activities.

Methodological preparation for logical thinking and the enhancement of logical reasoning among future primary school teachers require a high level of intellectual operations, including analysis, synthesis, abstraction, generalization, and practical application. Moreover, such preparation presupposes the efficiency, independence, and flexibility of thinking processes.

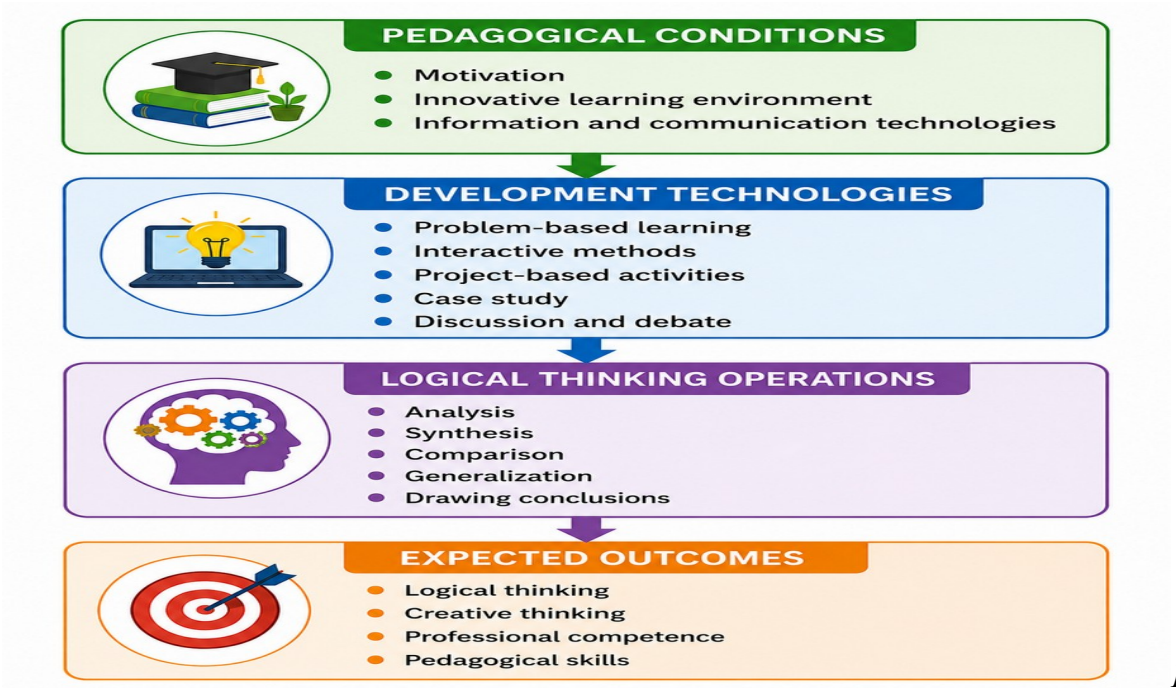


Figure 1. Model of the Logical Thinking Development Process among Future Primary School Teachers

A future teacher seeks to understand the objectives of educational problems and accomplish assigned tasks within the primary education process by independently interpreting problem situations and clarifying personal goals. In this process, the teacher's ability to understand learners, comprehend educational objectives, and direct their psychological, intellectual, and physical potential toward specific goals creates opportunities for students to acquire knowledge, develop practical skills and competencies, enhance cognitive abilities, and improve speech and communication skills.

In this regard, a future primary school teacher, through comprehensive mastery of psychology, pedagogy, and didactics, should be capable of identifying various educational problems, selecting appropriate forms and methods of instruction, analyzing the causes of students' difficulties, demonstrating responsibility, diligence, and self-monitoring skills, and relying on national and universal values. These qualities contribute to the continuous improvement of the content and methodology of each educational activity.

The effectiveness of educational practice also depends on creating favorable conditions for teachers to achieve high performance through the development of scientific potential, the availability of educational and methodological resources, handouts, and didactic materials, the quality and relevance of these materials, recognition of professional achievements by colleagues, and the effective use of modern information and communication technologies. Furthermore, organizing practical training seminars aimed at revealing the essence and content of creative activity, ensuring the thorough mastery of scientific foundations for introducing innovations in science and technology into educational practice, fostering new approaches to organizing creative activities, and enhancing skills in designing and implementing creative work are all important factors in ensuring educational effectiveness.

CONCLUSION

The worldview, intellectual capacity, and logical thinking characteristics of future primary school teachers determine the effectiveness, depth, durability, and speed with which they master

teaching methods and approaches, as well as their ability to assess students' knowledge and learning outcomes. The pedagogical conditions and didactic support aimed at methodologically preparing future primary school teachers for logical thinking, together with their individual characteristics, perceptions, research interests, teacher–student relationships, and intellectual potential, serve as essential factors in improving the quality of education and upbringing.

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THE NEW PARADIGM OF EDUCATION IN VOCATIONAL TRAINING UNDER DIGITAL TRANSFORMATION: GLOBAL EXPERIENCE AND THE CHINESE PATH

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Abstract. *This article examines the new educational paradigm emerging in vocational education under conditions of digital transformation, with particular attention to global trends and the Chinese pathway of reform. The study argues that vocational education is no longer limited to the transmission of occupational techniques in classrooms and workshops. In the context of Industry 4.0, artificial intelligence, platform employment, and data-driven production, vocational training increasingly functions as a strategic mechanism for economic modernization, technological sovereignty, social mobility, and regional development. The purpose of the article is to identify the structural features of this new paradigm, explain how digital technologies alter practice-based learning, and summarize what can be learned from China's attempt to connect vocational education with national digital infrastructure and industrial policy. Methodologically, the article is based on comparative-pedagogical analysis, policy-document review, and conceptual synthesis. The analytical corpus includes materials related to TVET digitalization, artificial intelligence in education, EdTech, skills ecosystems, and Chinese vocational education reforms. The findings show that the conventional 'course + workshop + short internship' model is being replaced by a more complex 'platform + simulation + enterprise + data-driven governance' model. In this model, digital platforms organize learning resources, simulations provide safe and repeated practice, enterprises participate in curriculum renewal and workplace assessment, and learning analytics make competence formation more visible. The Chinese experience is significant because it combines national smart education platforms, school-enterprise cooperation, large-scale investment, and the alignment of training programs with real-sector demand. The article concludes that successful digital transformation in vocational education requires not only equipment and software, but also redesigned curricula, new teacher roles, ethical AI governance, micro-credential systems, and sustainable partnerships between educational institutions and industry.*

Keywords: *vocational education; digital transformation; artificial intelligence; TVET; industry-education integration; Chinese model; practice-based learning; digital platform; micro-credentials.*

1. Introduction

Vocational education has entered a period of deep structural change. In the twentieth century, the dominant purpose of vocational training was to prepare workers for relatively stable occupations, predictable production routines, and clearly defined technical operations. In many systems, this task was organized through a sequence of theoretical courses, workshop demonstrations, short periods of practice, and final examinations. Such a model was suitable for industrial environments where technologies changed slowly and where a qualification obtained at the beginning of a career could remain relevant for many years. The current situation is different.

Digital production, artificial intelligence, cloud platforms, robotics, big data, and flexible forms of employment are rapidly changing the content of work. Occupational tasks are no longer only manual or routine; they require the ability to interpret data, collaborate with machines, adapt to new interfaces, make decisions in uncertain situations, and update skills continuously.

Under these conditions, vocational education is becoming more than a system for supplying labor to the economy. It is turning into a strategic institution that influences economic modernization, technological independence, social mobility, and the competitiveness of regions. Countries that can renew their vocational education systems are better able to respond to the needs of emerging industries, reduce skill mismatches, and support inclusive participation in the labor market. Countries that remain dependent on outdated workshop models risk producing graduates whose certificates do not correspond to the real competencies required by employers.

Digital transformation therefore changes the logic of vocational education at several levels. At the level of infrastructure, training is no longer confined to a classroom, workshop, or single institution. Learning may take place through cloud platforms, virtual laboratories, simulation centers, enterprise sites, and remote monitoring systems. At the level of pedagogy, teaching is increasingly supported by digital resources, adaptive tasks, e-portfolios, and data-based feedback. At the level of governance, educational institutions are expected to use evidence about learners' progress, employment outcomes, employer demand, and qualification relevance. At the level of social purpose, vocational education must help learners become adaptable professionals rather than only performers of fixed procedures.

The traditional model of 'theory + workshop + short practice' is no longer sufficient in such an environment. This model often separates school learning from real production, evaluates students mainly through final results, and provides limited opportunities for repeated practice in complex or risky conditions. A new paradigm is needed, one that links practical training with digital platforms, simulation tools, enterprise participation, electronic assessment, and personalized learning pathways. This does not mean that workshops and hands-on practice should disappear. On the contrary, practice remains the heart of vocational education. However, it must be reorganized through hybrid learning environments where students first test actions in virtual or simulated conditions, then apply them in campus workshops, and finally verify them in real workplaces.

Global experience demonstrates that digital transformation in vocational education should not be understood as a simple purchase of hardware or software. It is a systemic redesign of curriculum architecture, teacher professional identity, assessment culture, institutional partnership, and educational management. International organizations increasingly describe modern TVET through concepts such as future-ready skills, skills ecosystems, digital transformation, flexible pathways, lifelong learning, and learning analytics. These concepts point to the same direction: vocational education must become more responsive, more data-informed, more integrated with industry, and more open to individual learner trajectories.

The Chinese experience is especially important for analysis because China has attempted to connect vocational education reform with industrial upgrading, national digital platforms, and large-scale school-enterprise cooperation. Its pathway does not represent a universal model that can be copied mechanically by other countries. Nevertheless, it provides useful institutional lessons. China treats vocational education not as a secondary or residual track, but as a component of national modernization. It has developed digital public service platforms, expanded vocational colleges, promoted integration between education and production, and emphasized the preparation

of skilled personnel for priority technological sectors. For countries seeking to reform vocational education under digital transformation, this experience offers both practical ideas and critical questions.

The purpose of this article is to identify the main features of the new educational paradigm in vocational training under digital transformation, analyze global tendencies in this field, and summarize institutional lessons from the Chinese pathway. The article addresses three research questions: first, how does digital transformation change the organization of practice-based learning in vocational education? Second, what role do industry-education integration and artificial intelligence play in the new paradigm? Third, what lessons can be drawn from China's experience for the modernization of vocational education systems?

2. Methods

This study is designed as a theoretical and comparative-pedagogical analysis rather than as an experimental classroom intervention. The research object is the transformation of vocational education under the influence of digital technologies, artificial intelligence, and industry-education integration. The subject of analysis is the emerging paradigm that connects learning platforms, simulation-based practice, enterprise participation, data-driven governance, and flexible certification. Because the issue is systemic and policy-oriented, a document-based methodology was selected.

The source corpus consisted of international and national materials related to digital transformation in TVET, artificial intelligence in education, EdTech for vocational training, skills ecosystems, and Chinese vocational education reforms. The analysis drew conceptually on materials associated with UNESCO-UNEVOC, UNESCO guidance on generative AI in education and research, OECD reports on future-ready vocational education and innovative technologies, World Bank discussions of EdTech for TVET, and official Chinese documents on smart education platforms and vocational education reform. These sources were not treated merely as references; they were used to identify the categories through which the new paradigm can be described.

Three analytical criteria were applied. The first criterion was the digital infrastructure of practice-based learning. This included the presence of digital platforms, virtual or augmented simulation, electronic portfolios, digital twins, remote practice monitoring, and learning management tools. The second criterion was the institutional mechanism of industry-education integration. This included school-enterprise cooperation, employer participation in curriculum design, workplace mentoring, dual training elements, and the alignment of qualifications with real-sector demand. The third criterion was the use of artificial intelligence and data analytics in teaching, assessment, and governance. This included diagnostic feedback, adaptive learning paths, identification of skill gaps, micro-credentialing, and ethical management of learner data.

The analysis proceeded in four stages. At the first stage, the traditional vocational education model was reconstructed as a baseline consisting of classroom instruction, workshop practice, short internship, and final certification. At the second stage, global tendencies were compared in terms of how they challenge this baseline. At the third stage, the Chinese pathway was examined as an example of large-scale digital and institutional integration. At the fourth stage, a conceptual model of the new paradigm was synthesized. The model does not claim to predict all national reforms, but it clarifies the structural transition from a course-centered system to an ecosystem-centered system.

The limitation of the study is that it relies on policy and conceptual analysis rather than on direct measurement of learners' skill outcomes. Therefore, the findings should be understood as a

framework for institutional and pedagogical modernization, not as statistical proof of causal impact. Nevertheless, the approach is appropriate for identifying the logic of reform, because digital transformation in vocational education affects not only individual lessons but the whole architecture of training, assessment, partnership, and governance.

3. Results

The first result is that the spatial organization of practice-based learning is expanding. In the traditional paradigm, practice usually takes place in a workshop, laboratory, or enterprise site. These spaces remain important, but they are no longer sufficient. The new paradigm creates a hybrid ecosystem in which a learner can observe a process through digital content, perform the first attempt in a simulation, repeat the procedure in a workshop, apply it in an enterprise, and record evidence in an electronic portfolio. This sequence makes practice more continuous and safer. It is especially valuable in areas where equipment is expensive, mistakes are risky, or technologies change quickly.

Simulation is one of the most important elements of this transformation. Virtual reality, augmented reality, digital twins, and smart trainers allow learners to repeat complex operations without damaging equipment or endangering themselves. For example, a student can practice a technical operation in a simulated environment, receive immediate feedback, and repeat the task until the required standard is reached. This does not replace real practice, but it prepares the learner for it more effectively. In traditional workshops, time, materials, and equipment availability limit the number of attempts. In simulation-based environments, repeated practice becomes easier to organize and easier to monitor.

The second result is that industry-education integration becomes the central mechanism of the new paradigm. A vocational program that is disconnected from employers quickly becomes outdated because technologies, production standards, and work organization change faster than curriculum cycles. In the new paradigm, enterprises are not only sites for internships; they become co-designers of curriculum, providers of authentic tasks, sources of mentors, and participants in assessment. This changes the nature of vocational education from school-centered training to ecosystem-based skills formation.

The Chinese pathway illustrates this shift at a systemic level. Chinese reforms link vocational education with industrial modernization, regional development, and national digital infrastructure. School-enterprise partnerships, pilot cities, integrated enterprises, and large-scale vocational institutions are used to align training with economic demand. The reported scale of investment and the existence of thousands of vocational colleges show that vocational education is treated as a major national resource. The lesson is not only that China invests in vocational education, but that it connects investment with a broader industrial strategy.

The third result is the growing importance of national and institutional digital platforms. A platform is not merely a website for storing textbooks. In the new paradigm, a platform organizes learning resources, collects evidence of competence, provides access to simulation materials, supports communication between teachers and learners, and enables data-driven monitoring. China's National Smart Education Platform is significant because it connects general, vocational, and higher education segments within a broader digital education ecosystem. For vocational education, this kind of platform can reduce fragmentation, improve access to resources, and support common standards of quality.

The fourth result concerns artificial intelligence. AI-supported teaching changes vocational education not by replacing the teacher, but by strengthening diagnostic, adaptive, and feedback

functions. AI can help identify what a learner already knows, what skill gap remains, which task should be practiced next, and which form of feedback is needed. In vocational education, where skill formation requires repeated performance, such diagnostic support can be highly valuable. AI can also assist teachers by reducing routine administrative work, organizing learning analytics, and highlighting students who need additional support.

However, the use of AI also introduces risks. Vocational training often involves safety-sensitive decisions, professional responsibility, and real equipment. Therefore, AI should not be used as an uncontrolled automation system. It must operate within a human-centered pedagogical design. The teacher, enterprise mentor, and algorithmic system should form a cooperative triangle. The teacher interprets learning needs, the mentor connects learning with professional reality, and the AI system supports diagnosis, feedback, and documentation. This division of responsibility is essential for ethical and effective digital transformation.

The fifth result is that assessment becomes more dynamic. In traditional systems, assessment often depends on final examinations or general grades. In the new paradigm, the learner's competence profile is built gradually through digital evidence. E-portfolios, micro-certificates, electronic logbooks, and performance records make it possible to document specific skills rather than only completed courses. This is especially important for employers, because a diploma alone may not show whether a graduate can perform a particular task. A dynamic competence profile can show what the learner practiced, in which environment, under which standard, and with what level of independence.

4. Discussion

The findings suggest that digital transformation should be interpreted as a paradigm shift, not as a technical modernization campaign. When institutions only purchase equipment, open a computer room, or introduce isolated online lessons, the deeper structure of vocational education remains unchanged. The old model continues to dominate: teachers explain, students imitate, workshops provide limited practice, and final examinations summarize achievement. The new paradigm requires a different logic. It begins with the question of what a learner must be able to do in a changing workplace and then builds a learning ecosystem around that competence.

This ecosystem has four main layers. The first layer is digital infrastructure. It includes platforms, simulation centers, virtual labs, electronic records, and data systems. The second layer is pedagogical design. It includes task sequencing, repeated practice, feedback cycles, and integration of theory with performance. The third layer is partnership. It includes enterprises, mentors, sector councils, regional industry clusters, and employment services. The fourth layer is governance. It includes standards, quality assurance, data ethics, funding, and mechanisms for continuous curriculum renewal. If one layer is missing, the transformation remains incomplete.

The table below summarizes the difference between the traditional vocational education paradigm and the emerging digital paradigm. It also shows the specific contribution of the Chinese pathway and its implications for reform-oriented systems. The comparison demonstrates that the main change is not the replacement of practice with digital tools, but the reorganization of practice through a more intelligent and connected environment.

Table 1. Comparative features of the traditional and digital paradigms in vocational education

Dimension	**Traditional vocational model**	**Emerging digital paradigm**	**Implication for reform**
Learning	Classroom,	Platform, simulation,	Institutions need

space	workshop, and short internship are treated as separate spaces.	workshop, and enterprise practice are connected as a hybrid ecosystem.	infrastructure that links campus training with remote, virtual, and workplace learning.
Role of practice	Practice follows theory and is often limited by equipment, time, and safety constraints.	Practice is repeated through simulation, then verified in workshops and enterprises.	Skills can be developed gradually, safely, and with more visible evidence.
Industry relationship	Enterprises mainly host internships after school-based instruction.	Enterprises co-design curricula, mentor learners, and assess authentic workplace tasks.	Partnership must move from formal cooperation to shared responsibility for competencies.
Teacher role	Teacher explains content, demonstrates operations, and evaluates final performance.	Teacher becomes digital mentor, practice designer, data interpreter, and coordinator with enterprise mentors.	Teacher training must include platform use, simulation design, analytics, and industry collaboration.
AI and analytics	Assessment depends mainly on teacher observation and final examinations.	AI supports diagnosis, feedback, individual pathways, and identification of skill gaps.	AI must strengthen human-centered pedagogy and remain under ethical oversight.
Certification	Diploma and final grades summarize learning at the end of the program.	E-portfolios, electronic logbooks, and micro-certificates document specific competencies.	Employers receive clearer evidence of what graduates can actually perform.
Chinese pathway	Vocational education can remain institution-centered and fragmented.	National platforms, pilot cities, and school-enterprise integration connect TVET with industrial modernization.	Reform should be coordinated with labor market strategy, regional development, and digital governance.

The comparison shows that the Chinese pathway has two important strengths. First, it treats vocational education as part of a national modernization project. This helps overcome the common perception that vocational education is a lower-status route. When vocational education is connected with industrial policy and digital infrastructure, it becomes a source of innovation and social mobility. Second, China emphasizes scale. Digital platforms, pilot cities, and enterprise partnerships are not presented as small experimental projects only; they are linked to national implementation. Scale matters because vocational education cannot influence the labor market if innovation remains limited to a few exemplary institutions.

At the same time, the Chinese pathway should be interpreted carefully. Other countries cannot simply copy it because governance systems, labor markets, funding models, and institutional cultures differ. The transferable lesson is not a fixed formula, but a reform principle: vocational education should be built as a coordinated ecosystem. For Uzbekistan and other developing or transition contexts, this means that digital transformation should begin with priority sectors, clear qualification standards, partnership with enterprises, and teacher retraining. It is better to develop a few high-quality hybrid training models connected to real employers than to distribute technology superficially across many institutions without changing pedagogy.

Teacher professional development is one of the most important conditions for this transition. In the traditional model, the teacher is mainly an instructor who explains theory and demonstrates procedures. In the new paradigm, the teacher becomes a digital mentor, practice designer, data interpreter, and coordinator of learning between the institution and enterprise. This requires new competencies: ability to work with learning platforms, design simulation tasks, interpret analytics, guide e-portfolio development, and cooperate with industry mentors. Without teacher retraining, digital equipment will remain underused.

Curriculum architecture must also change. Traditional curricula are often organized around subjects and weekly hours. The digital paradigm requires modular design organized around competencies and performance levels. A student should be able to move from basic awareness to simulated practice, from guided workshop performance to workplace application, and from teacher feedback to independent professional action. Each module should specify the digital resource, practical task, assessment evidence, and employer relevance. This approach helps reduce the gap between curriculum documents and workplace reality.

Assessment reform is equally important. Final examinations alone cannot capture the complexity of vocational competence. The new paradigm requires a mixed system that includes practical performance, digital logs, reflective reports, mentor evaluations, simulation results, and micro-credentials. Micro-certificates can confirm specific competencies, such as operating a particular machine, using a safety protocol, completing a diagnostic task, or applying digital production software. This makes learning more transparent and allows graduates to present employers with a concrete competence profile.

Ethical and governance issues must not be ignored. Digital platforms collect large amounts of data about learners, teachers, tasks, and outcomes. AI systems may influence feedback, ranking, and learning opportunities. Therefore, institutions need rules for data privacy, transparency, human oversight, and fairness. Learners should understand how their data is used. Teachers should be able to question algorithmic recommendations. AI should support educational decisions, not silently determine them. In vocational education, where assessment may affect employment opportunities, such principles are especially important.

The proposed conceptual model in Figure 1 shows the new vocational education paradigm as the interaction of five elements: digital platform, simulation space, enterprise integration, AI-supported learning, and competence evidence. These elements are not separate innovations. They form one cycle. The platform provides access and data; simulation enables repeated and safe practice; enterprise integration connects learning with work; AI supports diagnosis and feedback; competence evidence documents progress and employability. The model therefore shifts attention from isolated technologies to the relationship between technology, pedagogy, and labor market relevance.

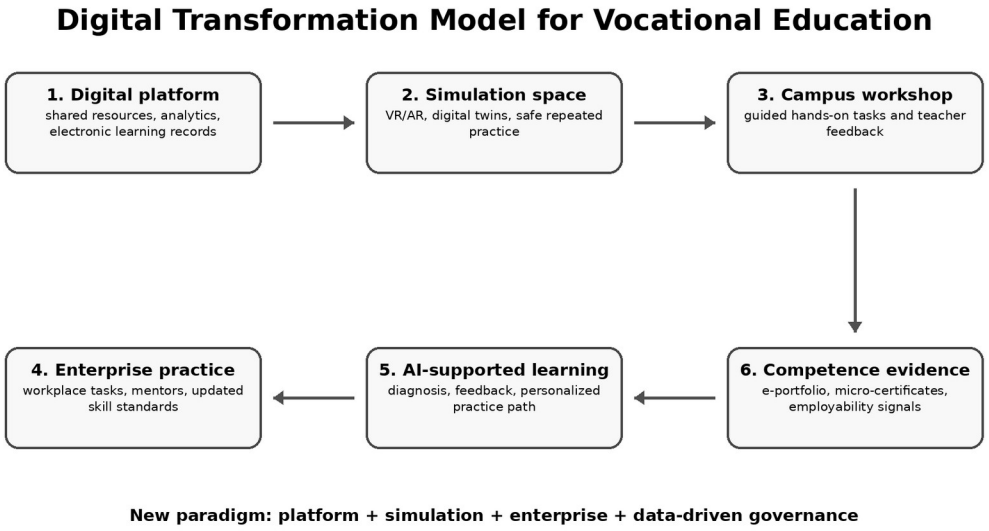


Figure 1. Conceptual model of the new vocational education paradigm under digital transformation.

5. Conclusion and Recommendations

This article analyzed the new educational paradigm emerging in vocational education under digital transformation, with a focus on global tendencies and the Chinese pathway. The analysis shows that vocational education is moving from a course-centered and workshop-limited model toward an ecosystem model based on digital platforms, simulation-based practice, enterprise participation, AI-supported feedback, and data-driven governance. The essential change is not that digital tools replace practical training. Rather, practical training becomes more intelligent, flexible, visible, and connected to real production.

The Chinese experience is significant because it demonstrates how vocational education can be linked with national digital infrastructure, industrial modernization, and large-scale institutional reform. Its key lesson is that vocational education should not be modernized as an isolated educational sector. It should be connected with regional development, labor market forecasting, enterprise partnership, technology policy, and digital public services. Such integration increases the relevance of vocational training and supports the preparation of highly skilled personnel for priority sectors.

For reform-oriented systems, several recommendations follow. First, vocational institutions should develop hybrid infrastructure that combines workshops, simulation centers, digital platforms, and enterprise practice sites. Second, qualification standards and learning modules should be updated with direct participation of employers. Third, AI assistants and learning analytics should be used to support individual learning trajectories, while preserving teacher responsibility and ethical oversight. Fourth, electronic portfolios and micro-certificates should be introduced to make specific competencies visible. Fifth, teachers should be retrained as digital mentors and coordinators of industry-linked learning. Finally, digital transformation should be evaluated not by the number of devices installed, but by the quality of practice, employability outcomes, and the ability of learners to adapt to technological change.

The future of vocational education will therefore depend less on the physical number of workshops and more on how intelligently practice is organized. A modern vocational institution should be able to connect the learner with data, simulation, equipment, mentors, enterprises, and

evidence of competence. Only such an integrated approach can make vocational education responsive to the demands of the digital economy and socially meaningful for learners.

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EDUCATIONAL MANAGEMENT IN MODERN UNIVERSITIES OF UZBEKISTAN

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Abstract. *The article explores the management system of a contemporary uzbek university. It examines the distinctive features of both the governing and operational subsystems, highlighting their roles and interaction within the institutional management framework. The study also discusses the essence and primary functions of higher education management. Particular emphasis is placed on the importance of educational management as a key driver of innovation, organizational improvement, and the enhancement of educational quality in universities.*

Purpose: The purpose of this study is to examine the management system of a modern Russian university, analyze the interaction between its governing and operational subsystems, and assess the role of educational management in promoting institutional innovation and improving the quality of higher education.

Keywords: *modern university, controlling and administered managing subsystem of Uzbekistan university, higher education management, innovative educational management.*

In the modern theory of educational management, there is a rethinking of the essence of educational organizations and the ways of their scientific representation. Previously, such organizations were considered as an object that is managed, but today the leading concepts of educational management consider them as a kind of subject of management and self-government. This fully applies to a modern university.

A modern university can be defined as an institution of higher professional education that actively performs educational activities., scientific research and economic functions based on the conditions of various contexts: socio-economic, political, socio-cultural, spiritual and moral. A modern university is increasingly becoming a learning and self—developing organization, and such organizations can no longer be considered from the point of view of a mechanistic approach - as a kind of fixed reality. A dynamic approach is needed, in which universities are considered as educational organizations representing volatile, active subjects interacting with the external environment and forming a certain organizational culture that reflects the individual characteristics of a particular university.

A modern university carries out innovative transformations and implements the tasks of its strategic development at the following levels:

— global, involving the integration of higher education into the European and global cultural and educational space;

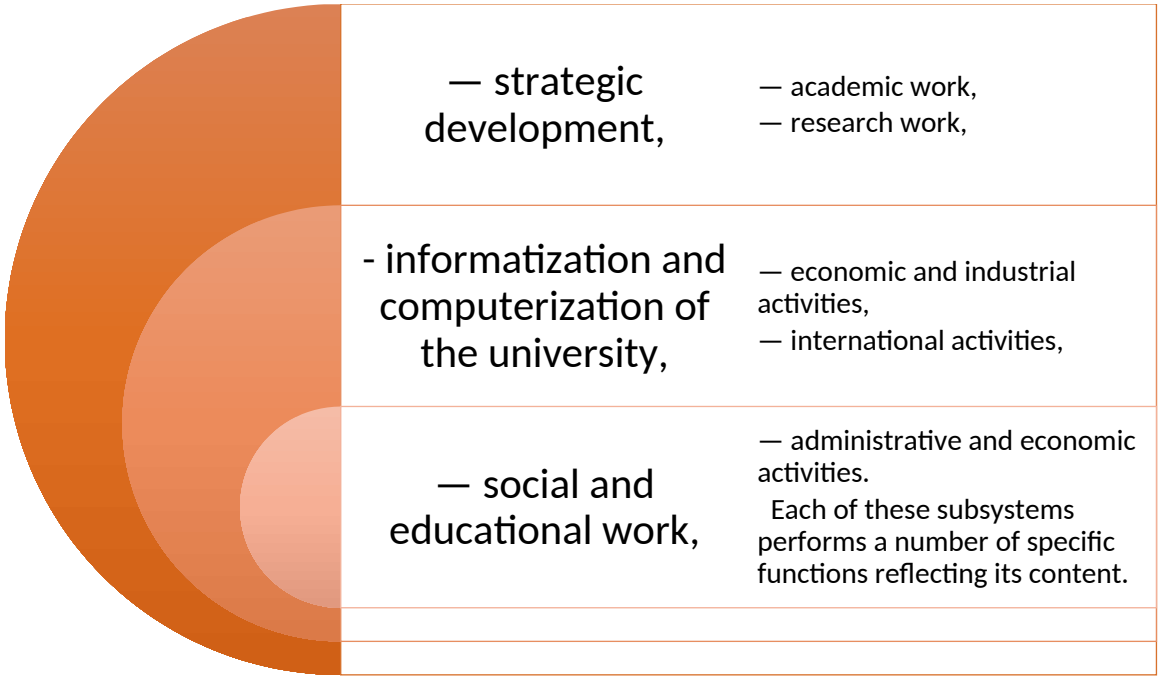
— national, focused on the formation of scientific knowledge and the training of highly qualified specialists for the development of the economy and society as a whole;

— territorial, providing for scientific, technical, human and ideological assistance to the development of the territory, flexible response to the needs of the labor market and social partnership;

— local, related to the innovative development of the university itself as an organization, which includes the construction of an effective education quality system, the development of progressive educational technologies, the creation of a productive university management model that stimulates the development of staff and student government.

The management system of Uzbek university represents the interaction of two subsystems: managing and managed.

For example, at the National Pedagogical University of Uzbekistan named after Nizami, the following management subsystems are of particular importance:



The strategic development management subsystem involves strategic planning and management, the development and implementation of programs and projects for the strategic development of the university, the definition of specific strategies at certain stages of organizational development, the development and implementation of a personnel strategy and the formation of a personnel reserve, the identification of the main groups of influence and the definition of strategies for interaction with them, the analysis of the external and internal environment of the university, the identification of its strengths and weaknesses, the development of a mechanism for monitoring the organizational development of the university.

The subsystem of educational work management includes the management of the educational process, the implementation of the requirements of state educational standards, the introduction of innovative pedagogical technologies into the educational process, the introduction of an educational quality management system, the strengthening of the material base of the educational process, management licensing, certification and accreditation procedures, organization of career guidance and pre-university training for future applicants. A significant result of the activity of this subsystem was the state accreditation of the university. The compliance of the content and quality of the university graduates' training with federal state educational standards or federal state requirements for a period of 6 years has also been confirmed.

The subsystem of the University's research management covers the planning and organization of scientific research in various fields of knowledge, the organization of scientific

events (conferences, seminars, workshops), the management of advanced training of scientific and pedagogical staff, the management of postgraduate, doctoral and dissertation councils, the organization of publishing activities. More than 50 scientific centers, research and educational laboratories have been created within this subsystem.

The results of scientific research are reflected in 2011, 89 monographs and 75 textbooks and teaching aids were published, as well as 1,857 articles in international and domestic publications.

The subsystem of management of informatization and computerization of the university provides the development and implementation of the concept of the educational process and scientific activity, management of computer networks and ensuring access of teachers and students to various information resources, the introduction of new information technologies in the educational process. this process, the introduction of distance and blended learning, as well as professional development of the teaching staff in the field of IT technologies. Subsystem of management of economic and production activities These include financial and accounting management, conducting marketing research in the market of scientific and educational services, attracting additional financial resources, managing labor and wages, managing the activities of small innovative enterprises, cooperating with enterprises in the city and region, and managing commercial activity.

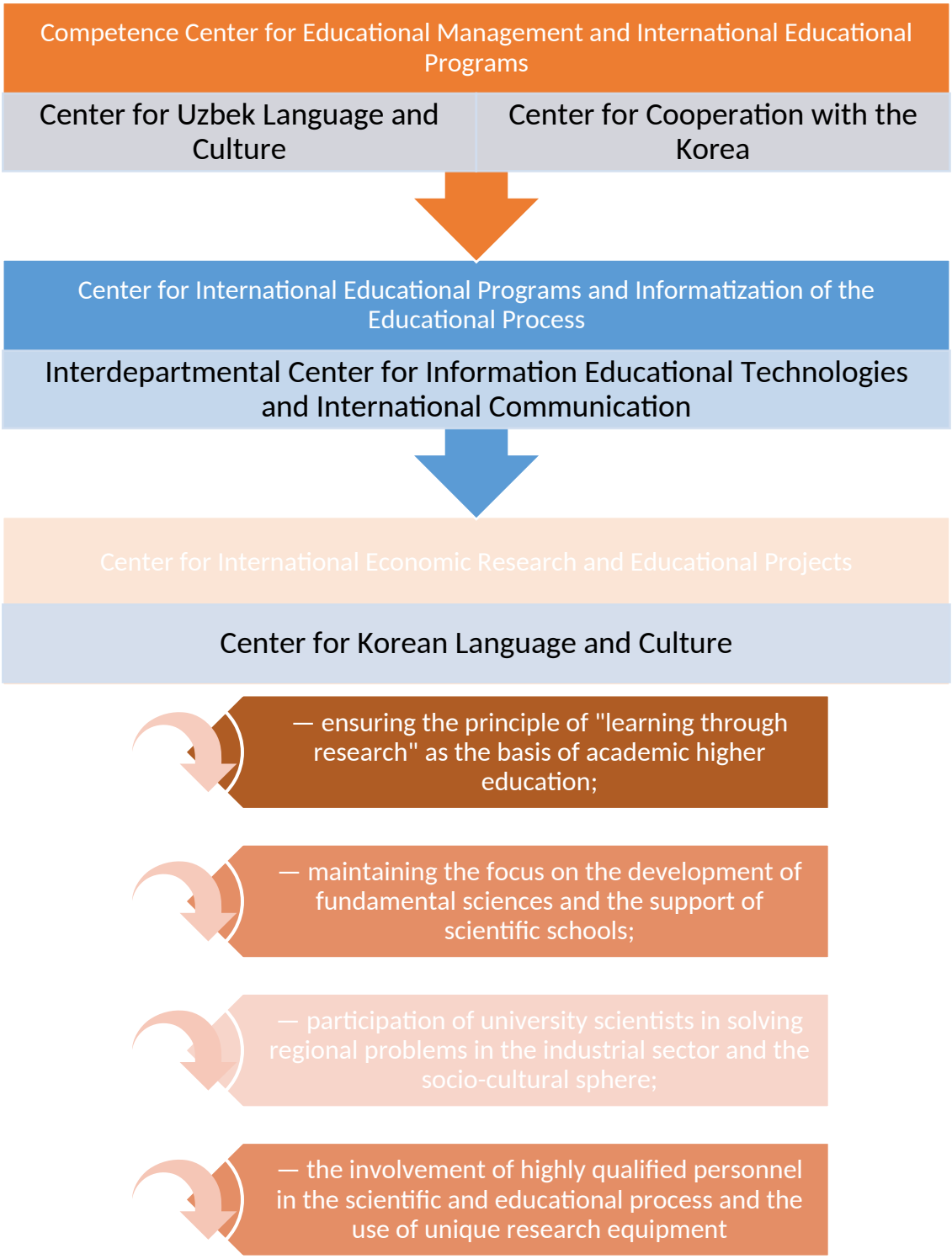
The flexible management structure of Uzbek universities ensures its innovative development as an open educational system, a center of science, culture and education in the region, a teaching and learning organization competitive in the global and domestic educational services market. Such a management model assumes flexible response to changes taking place in public and socio-economic life, productive interaction with the modern labor market, the ability to predict its development and future needs, overcoming departmental isolation, and ensuring relevance. scientific research, inclusion in the global processes of globalization of scientific knowledge and internationalization of education.

The subsystem of international activity management covers the creation of an organizational structure for managing international relations, managing international scientific and educational projects and academic programs, developing scientific and pedagogical cooperation with foreign universities and international strategic partnerships, interaction with international associations and consortia of universities, and managing the export of educational services.

In this regard, the personal and social significance of education, which is a sociocultural phenomenon and a universal human value, is enhanced. Higher professional education is becoming a mechanism for the development of personality, and hence public consciousness as a whole, a significant factor in social and economic progress, the international authority of the state in the new geopolitical conditions, and the basis of national security.

Higher school management is called upon to respond to modern challenges of the time. Higher school management is a university management system aimed at ensuring its high competitiveness in the domestic and foreign markets of educational services due to the high quality of the educational process and training of specialists, the high level of their professional knowledge, skills and abilities, principled citizenship and high moral qualities. Higher school management includes the management of various types of university activities (educational, research, industrial, entrepreneurial, financial and economic , etc.); operational management and coordination of the activities of various structural units; strategic planning and management; development of a quality policy for higher education, development of quality management and its

integration with the overall management of the university; staff development and professional development; social protection and support for teachers, staff and students of the university.



The tasks of higher school management are largely determined by the functions that the university performs in modern conditions: basic (educational, research, educational), market and social. The implementation of these functions is facilitated by information technology. The development of a new information culture at the university is accompanied by significant changes in the management system. The principles of innovative and passionate management are being implemented. Special positions and management bodies are being introduced to coordinate the management of innovation processes. Created by the Institute of consultants-supervisors who carry

out consulting activities in the field of choosing the strategy of innovative development of universities. The system of infrastructural support ensures the effectiveness of innovation activities, and the system of management measures ensures a productive transfer of innovative technologies, university and business cooperation.

At the same time, the methodological guidelines of management activities in universities in line with innovation management are the following:

The principles of innovative educational management are combined with the attitudes of passionate university management, which is understood as management that sets intractable or quasi-intractable management tasks, but strives to find their probabilistic solution. In other words, it is a strategy of finding comprehensive resources for innovative management without attracting additional budget allocations.

The emphasis on leaders is also reflected in the creation of federal universities, on the basis of which it is planned to form a system of world-class scientific and educational complexes. According to a number of scientists, the strengthening of monopolism those who are "appointed" as leading universities may lead to a decrease in real competition in the field of higher education. In the discussion about the "purpose" of leading universities, it is important to increase their internal competitiveness by reducing competition itself, which is achieved by administrative management methods. At that at the same time, the true competitiveness of the university should be achieved as a result of effective management of the higher school, which makes it possible to provide truly elite education.

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PROSPECTIVE PLANS AND RECOMMENDATIONS FOR IMPROVING THE PROFESSIONAL COMPETENCE OF FUTURE PRIMARY TEACHERS BASED ON THE REQUIREMENTS OF THE PIRLS INTERNATIONAL ASSESSMENT RESEARCH

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Abstract. *This scientific article deeply covers the issues of gradual improvement and development of professional competence of future primary school teachers based on the criteria and requirements of the international assessment program PIRLS (Progress in International Reading Literacy Study). Scientific research in the field of studying international assessment programs is expanding worldwide. In modern pedagogical practice, the following areas are of priority importance: improving reading literacy, competency-based literacy, effective use of digital technologies in the educational process, establishing collaborative activities between teachers and students, developing students' creative thinking, and improving the effectiveness of education based on software electronic resources. This article is aimed at developing professional competencies of future primary school teachers in the PIRLS international assessment program, developing their imagination, and improving their knowledge, skills, and qualifications in the process of preparing for assessment studies. This, in turn, necessitates the development of a pedagogical system for preparing for international assessment studies. The results of the study can be effectively used in the educational process of higher educational institutions and in the retraining courses of primary school teachers. Identifying teaching methods and educational strategies that have the most effective impact on the development of reading literacy of primary school students based on the PIRLS study, in turn, will serve to provide a deeper understanding of the professional qualities and competencies necessary for the successful pedagogical activity of teachers, as well as to improve teacher training and professional development programs. Students' skills and abilities such as finding and evaluating information, making decisions, adapting to changing circumstances, and working in a team are among the important values. Finding information and evaluating it requires that students have a certain level of reading skills. Based on the new requirements for education, the concept of evaluation of educational results is also changing. Currently, in this concept, the assessment of the level of reading literacy of students occupies a special and important place*

Keywords: *PIRLS, ePIRLS, primary education, professional competence, reading literacy, interactive texts, critical thinking.*

Enter.

Today, it is important to develop creativity in future primary school teachers, to form skills based on modern knowledge in solving real-life problems. This creates the need to develop students' literacy levels in subjects, to study international experiences in improving the quality of education, and to develop modern teaching methodological recommendations based on the

popularization of best practices in the field. Based on the results of international assessment studies, reforming the content of basic educational literature, developing a set of national questions and integrating them into programs has become a priority area of state policy in the field of education. As a result of continuous reform in the education system, countries implement various changes and new approaches in the international assessment program studies based on their participation. International studies are also important for the state education system and its development. The International Association for the Evaluation of Educational Achievement (IEA) has announced the results of the PIRLS study to assess the reading literacy of 4th grade students. The fifth international program was held in 2021, and Uzbekistan, participating for the first time, ranked 49th out of 57 countries with a score of 437.

The study organizers divided students into four groups according to their reading proficiency levels: low, medium, high, and highest. Among the participating students from Uzbekistan, the average score achieved by girls was 449 points, while that of boys was 425 points. When comparing results by text type, it was noted that students understood fiction better than informational text: the average score for comprehension of fiction was 438, and for informational text it was 434[9;p-355].

According to D.A. Utanbayeva, “preparing primary school students for the international assessment program is based on the analysis of language levels of native language literacy and reading literacy as the main objects, the application of linguistic skills to speech skills, obtaining information from the context, thinking, understanding information, individual psychological processes, descriptive graphic tools, visual context, text transformation, working with simple contexts for a primary school student, and increasing verbal and logical knowledge in reading and understanding texts in various academic subjects, developing oral and written speech” [10; 55-b].

D.E. Avazova “PIRLS texts are classified based on their main purpose, and the questions asked on their basis are reflected in the intended reading objectives. That is, texts belonging to the literary category consist of questions related to the topic, plot, characters, and setting, while information-rich texts consist of questions related to the information provided in the texts. Although the texts differ in terms of their intended reading objectives, the comprehension process is not different for both purposes, but rather similar” [1;152-b].

According to Ina V.S. Mullis, the increased use of international assessment results has led to a growing interest in analyzing international assessment data. International assessments such as TIMSS and PIRLS have increased the capacity of many countries to conduct assessments, improve national assessments, and analyze data [1; p. 18]. Researchers around the world are analyzing TIMSS and PIRLS data and conducting supporting studies to identify teaching practices, resources, and materials that can improve teaching and learning in mathematics, science, and reading. Researchers in some countries are even collaborating with experts from non-participating countries to help these countries initiate curriculum and teacher education reforms[3;45-b]. TIMSS and PIRLS achievement results provide key information about the educational context for teaching, primarily to monitor educational achievement and, equally importantly, to inform educational reform, particularly in mathematics, science, and the curriculum. Educating all children in a nation is a daunting and complex task in any given country. Participation in international assessments provides access to a wide range of ideas and approaches for improving education. International assessments are based on the premise that each country can learn from the experiences of other countries and that many countries participate in order to gain valuable insights into successful approaches to teaching and learning. Studies examining the relationship between

TIMSS and PIRLS results and subsequent changes in curriculum and pedagogy will also need to take into account any other factors.

The components of professional training of future teachers for the PIRLS international assessment survey, their competence in designing tasks aimed at developing reading literacy, mechanisms for integrating international assessment requirements into practical pedagogical activities, technologies for developing methodological competence based on the use of digital educational tools, as well as the criteria for the effectiveness of this process and the diagnostic system have not been sufficiently developed. Also, scientific research on a holistic model, methodological support and practical mechanisms for training future primary school teachers based on PIRLS requirements in higher pedagogical educational institutions is limited. Therefore, the training of pedagogical personnel in accordance with international assessment requirements is of urgent scientific and practical importance in terms of improving the quality of primary education and students' reading literacy, and strengthening the country's competitiveness in PIRLS results.

The PIRLS assessment system requires students to not only read text fluently, but also to find explicit information in the text, draw direct conclusions, integrate ideas and information, and evaluate the content and form of the text. To develop these skills in students, the future teacher himself must have the necessary professional competencies (Table 1).

Competency type	Content and essence	Role in PIRLS research
Methodological competence	Formulate and deliver assignments to students according to their level of understanding of the text.	Develops students' logical and critical thinking.
Digital competence (ePIRLS)	Working with hypertexts, visual and interactive resources, simulations.	Ensures the correct search and sorting of information in the digital environment.
Analytical competence	Analyzes students' errors and makes methodological corrections..	Provides final and diagnostic conclusions based on the assessment results.

Table 1. Types of professional competence improvement for a future teacher according to PIRLS

The following promising plans and stages are proposed for methodological preparation of future primary school teachers for the PIRLS international assessment study:

Stage I: Enriching the curricula of higher education institutions with Interactive Modules. Including the topics of 'PIRLS and ePIRLS assessment methodology' as a separate module in the subjects of 'Reading literacy based on international assessment programs' and 'Pedagogical skills' in the curricula of the primary education direction.

Stage II: Organizing practical methodological laboratories. Organizing 'PIRLS and Digital Literacy' laboratories at higher education institutions, where students will be able to create simulated tasks and create electronic texts and infographics.

Stage III: Revising the methodology of pedagogical practice. Establishing as a mandatory component the conduct of training sessions consisting of textual and interactive tasks in the PIRLS format during the pedagogical practice of students in schools[5;.p-130].

“Problem-based learning” technology. This methodology aims to teach future teachers to correctly find solutions to various problem situations in the content of the subject and to develop

their skills in determining the essence of the educational problem, introducing innovative methods of solving the problem and learning to correctly interpret the causes of the problem. The training is carried out on the basis of a film, students carefully watch the process and try to identify the problem covered in it, which must be saved in memory or kept by each group member. If it is not possible to show a film, the teacher can use photographs on the subject of the study or text and educational material from educational literature describing a problem. As a result of training with this technology, future teachers will try to solve the problem by identifying its causes before solving it, and then choosing the methods they need.

In order to improve the methodological readiness of primary school teachers to teach based on the PIRLS international assessment program, it is necessary to use appropriate educational forms, methods and tools. At the initial survey stage, the initial data on the PIRLS tasks from future primary school teachers are collected, evaluated and corrected, clarification is made in solving tasks, selection of additional training to be continued at the independent assessment stage, and at the final selection stage, attention is paid to educational forms, methods and tools in improving the methodological readiness of future primary school teachers to teach based on the PIRLS international assessment program. The current state of methodological competence of future primary school teachers was determined based on the requirements of the PIRLS international assessment study, and their knowledge, skills and qualifications in developing reading literacy, working with text, analytical thinking, and using assessment criteria were studied;

A system of pedagogical conditions, content, form, methods and tools aimed at forming methodological competencies in future primary school teachers in accordance with the requirements of the PIRLS international assessment was defined;

In order to develop and implement improved methodological support aimed at developing the methodological competence of teachers, PIRLS tasks, text analysis, criteria for assessing students' learning activities, and modern pedagogical technologies were used;

in the experimental group, pedagogical experimental and test work was organized based on the recommended methodology, in which special exercises, practical tasks, seminars, trainings, and independent educational activities were carried out;

in order to determine the dynamics of the formation of methodological competence of future primary school teachers in relation to the requirements of the PIRLS international assessment survey, monitoring was carried out in the control and experimental groups based on diagnostic criteria, indicators, and assessment levels.

Conclusion

Improving the professional competence of future primary school teachers based on the PIRLS criteria is not just preparation for international tests, but also a guarantee of educating a new generation of logical and critical thinkers. The implementation of the above-mentioned promising plans and recommendations in the educational process of higher education institutions will serve to bring the competitiveness of future teachers and the quality of education to a new level.

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METHODOLOGY FOR DEVELOPING LEXICAL-SEMANTIC COMPETENCE IN PRIMARY SCHOOL STUDENTS WITH HEARING IMPAIRMENT THROUGH AN INTERACTIVE ELECTRONIC DICTIONARY

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Abstract. *The article addresses the development of lexical-semantic competence in primary school students with hearing impairment and presents a methodology for organizing vocabulary instruction through an interactive electronic dictionary. The proposed approach is based on the understanding that vocabulary acquisition involves not only memorizing a written or spoken label but also establishing a stable relationship between a lexical unit, its meaning, and its subsequent use in communication. The methodology combines thematic organization of vocabulary, complementary modes of word representation, a gradual sequence of vocabulary learning, interactive reinforcement, and teacher-guided support. Written words are presented together with object images, sign-language support, and an auditory component that may be used according to the learner's available hearing abilities. These elements are treated as pedagogical supports rather than as independent instructional goals. The methodological sequence moves from initial familiarization with a lexical unit and clarification of its meaning to recognition, comparison, repeated retrieval, reinforcement, and later activation. Interactive tasks are incorporated to provide repeated engagement with previously introduced vocabulary through recognition, selection, matching, and recall. The teacher retains an organizing and supportive role by selecting lexical material, regulating the amount of assistance, monitoring comprehension, and gradually increasing learner independence. The article also discusses the proposed methodology in relation to international research on vocabulary interventions for deaf and hard-of-hearing learners, visual support, augmentative signs, and computer-based vocabulary learning. The resulting model positions the interactive electronic dictionary not merely as a digital repository of words but as a tool for structuring systematic vocabulary work. Its pedagogical value lies in the coordinated use of multimodal supports, thematically related lexical content, purposeful repetition, interactive activity, and differentiated teacher assistance. The methodology can be applied in special education settings to support the development of the lexical-semantic aspect of language in primary school students with hearing impairment.*

Keywords: *hearing impairment, lexical-semantic competence, interactive electronic dictionary, vocabulary development, special education.*

INTRODUCTION

Mastering a word involves considerably more than memorizing its graphic or sound form. For a lexical unit to become part of a child's language system, the learner must relate it to an object, action, or attribute, understand its meaning, connect it with previously acquired concepts, and learn to use it in an appropriate communicative situation. For primary school students with hearing

impairment, this process takes place under conditions of reduced access to naturally occurring spoken-language input. As a result, purposeful development of lexical-semantic competence becomes an important component of special education. [1]

Difficulties in vocabulary acquisition among children with hearing impairment may be manifested not only in a limited number of known words. Accuracy of word meaning, differentiation of semantically close concepts, establishment of semantic relations between lexical units, and retrieval of an appropriate word in independent speech are also important. Verbs, words denoting attributes, generalized concepts, and lexical items whose meanings cannot be inferred directly from the immediate context may present particular difficulty. Vocabulary instruction therefore requires conditions that support a gradual transition from the initial perception of a lexical unit to comprehension of its meaning and subsequent use. [1, 2]

Traditional visual materials remain important in the education of children with hearing impairment, while digital learning environments expand the possibilities for presenting and reinforcing language material. A digital resource can combine several forms of information, enable repeated access to previously introduced vocabulary, and involve the learner in interactive activity. These technical possibilities, however, do not by themselves determine educational value. The central issue is how a digital resource is incorporated into vocabulary instruction and which methodological actions support the gradual acquisition of lexical material. [2, 3]

For the development of lexical-semantic competence, particular attention should be paid to the coordinated use of different forms of word representation. A written word may be associated with an object image and a sign, and, when appropriate to the learner's hearing abilities, with an auditory component. Such representation should be accompanied by thematic organization of vocabulary and a purposeful sequence of learning activities. The proposed methodology therefore moves from familiarization with a word and clarification of its meaning to repeated recognition, reinforcement, and later activation through interactive tasks, while the teacher organizes the learning process and provides assistance when needed. [3, 4]

The relevance of the present work lies not in treating an electronic dictionary as an isolated digital product, but in defining a methodology for its use in systematic vocabulary instruction. The purpose of this article is to describe the content, structure, and methodological features of developing lexical-semantic competence in primary school students with hearing impairment through an interactive electronic dictionary.

MATERIALS AND METHODS

The article presents a methodological model developed within a study of vocabulary instruction for primary school students with hearing impairment. The model was constructed through analysis and synthesis of special-pedagogical approaches to vocabulary development and through the methodological organization of the functions available in an interactive electronic dictionary. The analysis focused on the relationship between the meaning of a lexical unit, the forms in which that meaning can be represented, the sequence of learning actions, the role of interactive reinforcement, and the degree of teacher support required at different stages of vocabulary work.

The methodology is based on the principle that lexical material should be organized thematically rather than presented as an unrelated set of individual words. Combining words into semantically connected groups makes it possible to work within a particular conceptual field, compare lexical units, establish relations between them, and gradually broaden the learner's representations of the surrounding world. The thematic sections of the electronic dictionary

therefore include objects, actions, attributes, and phenomena that are accessible and relevant to primary school learners. [2, 3]

A lexical unit is represented through several complementary supports. The written word is associated with an object image, a sign-language representation, and an auditory component. The image provides a visual-semantic reference; the written form links the graphic representation of the word with its meaning; the sign facilitates semantic access; and the auditory component can be used in accordance with the learner's available hearing abilities. The meaning of the word remains the central object of instruction, while the individual modes of representation function as supports for establishing the relationship between the lexical label and the concept it denotes.

Vocabulary work is organized as a gradual process. Initial familiarization with a word is followed by clarification of its meaning, repeated access to the lexical unit, recognition, association with the corresponding concept, reinforcement, and later activation. Interactive game-based tasks are incorporated into this sequence as a means of reinforcement and purposeful repetition. They require the learner to recognize previously introduced words, select an appropriate option, establish correspondences, and retrieve previously formed semantic associations. Repetition is therefore embedded in activity rather than reduced to repeated passive presentation of the same item. [3, 4]

The digital resource does not replace the teacher. The teacher selects the volume and sequence of lexical material, organizes the introduction of new vocabulary, monitors comprehension, and adjusts the amount of assistance. As the material becomes more familiar, the learner is given greater independence and may use the electronic dictionary for review and reinforcement. Teacher guidance and independent work are therefore treated as interrelated components of the same instructional system. [3]

RESULTS

The methodological development resulted in a structured model for integrating an interactive electronic dictionary into vocabulary instruction for primary school students with hearing impairment. The model brings together five interrelated components: thematic organization of lexical material, complementary representation of word meaning, gradual vocabulary acquisition, interactive reinforcement, and differentiated teacher support. These components are not treated as separate functions of a digital product; their instructional value emerges from their coordinated use within a single sequence of vocabulary work.

Practical implementation begins with the selection of a thematic unit and lexical items appropriate to the learners' age, current language development, and existing vocabulary. Work within one thematic group makes it possible to introduce new words while connecting them with familiar concepts. In this way, vocabulary acquisition is organized around semantically related content rather than the accumulation of isolated labels.

When a new lexical unit is introduced, the teacher guides the learner in relating the written word to its meaning through the image, sign-language representation, and, where appropriate, auditory support available in the dictionary. Attention is directed to the object, action, or attribute denoted by the word. Depending on the lexical item and the learner's needs, individual supports may be revisited and the degree of teacher mediation may vary.

Initial perception is followed by clarification of meaning. The learner is encouraged to associate the word with the corresponding object, action, or attribute, distinguish it from related concepts, and identify connections with other lexical units within the same thematic group. Questions, comparison of images, explanations, and sign support may be used according to the

learner's difficulties. The new word is consequently incorporated into a broader system of existing representations rather than learned in isolation.

Reinforcement is organized through interactive tasks that require an action from the learner. The child may need to recognize a word, choose an appropriate answer, match related elements, or restore a previously established relationship between a lexical form and its meaning. This format makes repetition active and allows the same vocabulary to be revisited in different learning situations.

As a thematic unit is mastered, the proportion of independent work increases. Learners can return to familiar vocabulary and complete tasks with less direct assistance. When difficulties occur, they can again use the image, written form, sign, or auditory component as a support. Teacher assistance can therefore range from detailed joint analysis of a new lexical unit to monitoring independent practice with previously acquired material.

The resulting organization allows the same digital resource to perform different methodological functions at successive points in vocabulary learning. At the beginning it supports access to the meaning of a new word; later it provides opportunities for reinforcement, review, and activation. The pedagogical potential of the dictionary is therefore determined by the selection of lexical content, the sequence of learning actions, the nature of interactive tasks, and the regulated assistance provided by the teacher.

DISCUSSION

The proposed methodology is consistent with contemporary research that views vocabulary development in deaf and hard-of-hearing learners as a process requiring purposeful instructional support. Aldemir, Solís-Campos, Saldaña, and Rodríguez-Ortiz reviewed vocabulary interventions for deaf and hard-of-hearing children and adolescents and found that explicit vocabulary instruction using multisensory and multimodal approaches can support vocabulary acquisition, while also emphasizing substantial variability across studies and the need for cautious interpretation of intervention effects [7].

The role of visual support is also reflected in the study by Birinci and Sarıçoban, who examined vocabulary instruction with 80 deaf learners of English as a foreign language. Learners who received visual materials together with sign-language instruction demonstrated better vocabulary learning and retention than those taught through sign-language instruction without the additional visual materials [5]. These findings are relevant to the proposed methodology because visual representation is used as a semantic support rather than as an isolated decorative component.

Augmentative signs may provide an additional route to word meaning. Van Berkel-van Hoof, Hermans, Knoors, and Verhoeven found that deaf and hard-of-hearing children benefited significantly from augmentative signs during a novel-word learning task [6]. This supports the inclusion of sign-based support as one of several possible resources for semantic access, while leaving the lexical meaning itself as the central instructional target.

At the same time, the mere presence of multiple forms of information cannot be treated as a guarantee of successful vocabulary acquisition. The systematic review by Aldemir and colleagues demonstrates variability in the effects of vocabulary interventions and highlights the importance of instructional design [7]. In the present methodology, the image, written word, sign, and auditory component are therefore used as coordinated supports within a sequence of purposeful work on word meaning rather than as a collection of simultaneously presented stimuli.

Digital activity can also provide opportunities for repeated engagement with lexical material. Barcroft and colleagues studied novel vocabulary acquisition during meaning-oriented

computerized auditory training for children who were deaf or hard of hearing. Their program included meaning-focused activities and simple computer games, and the authors reported vocabulary gains after training as well as retention of part of the acquired vocabulary [7]. This finding is relevant to the use of interactive tasks as a means of connecting work on word meaning with active computer-based practice.

The distinctive feature of the proposed approach is the integration of these possibilities into a single instructional organization: thematically related vocabulary, several accessible routes to word meaning, gradual reinforcement and retrieval, interactive activity, and adjustable teacher support. The electronic dictionary is not regarded as an independent factor in language development. Its methodological value depends on what the learner does with the lexical material, how the transition from initial exposure to comprehension and activation is organized, and what type of support is provided at each point in the learning process.

CONCLUSION

Developing lexical-semantic competence in primary school students with hearing impairment requires vocabulary instruction in which learning a word is understood as a gradual process of establishing relationships among its form, meaning, and use. An interactive electronic dictionary can support this process when it is incorporated into a coherent methodology rather than used solely as a digital means of presenting vocabulary.

The proposed methodology combines thematic structuring of lexical material, complementary presentation through written words, images, signs, and available auditory support, a gradual sequence of vocabulary acquisition, interactive reinforcement, and teacher guidance. The sequence moves from initial familiarization and clarification of meaning to recognition, reinforcement, repeated retrieval, and later activation of the acquired vocabulary.

Teacher support remains an essential component of the approach. The teacher determines the content and sequence of vocabulary work, adjusts the amount of assistance, monitors comprehension, and creates conditions for increasing learner independence. Repeated access to lexical material and interactive tasks make it possible to combine teacher-guided instruction with independent review and reinforcement.

The pedagogical value of the interactive electronic dictionary is therefore determined primarily by the way it is integrated into the educational process. Visual, sign-based, written, and auditory supports become meaningful when each is used for a specific instructional purpose and contributes to the learner’s movement from initial perception of a word to comprehension and activation of its meaning. The methodology may be used in special education settings to organize systematic work on the lexical-semantic aspect of language in primary school students with hearing impairment.

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THE SPIRITUAL AND EDUCATIONAL FUNCTIONS OF THE LOCAL PRESS IN THE CONTEXT OF A DIGITAL SOCIETY: THE CASE OF NAVOI REGION

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Abstract. *This article analyzes the spiritual and educational functions of the local press in the context of a digital society, using Navoi Region as a case study. It examines the role of local periodicals in providing the population with objective information, promoting national and universal values, preserving historical memory, and fostering young people's information literacy. The article also analyzes the impact of digitalization on the activities of local newspapers and the role of print publications in the emerging information environment.*

Keywords: *digital society, local press, Navoi Region, spiritual and educational promotion, information security, ideological immunity, digitalization.*

In today's era of globalization and the rapid development of digital technologies, information has become an integral part of human life. The widespread use of the Internet, social media, electronic publications, and mobile technologies has significantly expanded people's access to information. However, the increasing volume of information does not always produce positive outcomes. The proliferation of unreliable and unverified information on various websites and social media platforms, as well as content that may adversely affect spiritual and moral values, has become one of the most pressing challenges of the present day. Under these circumstances, the functions of the mass media, particularly the local press, are expanding. In addition to informing the population about events and developments within their respective regions, local newspapers are expected to perform a number of important functions, including promoting spiritual and educational values, preserving historical memory, encouraging young people to engage in social activities, and fostering a healthy information environment in society.

In the Republic of Uzbekistan, enhancing the role of the mass media in public life, supporting the professional activities of journalists, and developing the information sector are regarded as important areas of state policy. To date, the necessary legal and regulatory framework has been established to support the mass media and professionals working in the field. As President Shavkat Mirziyoyev emphasized, "…nearly ten legislative acts aimed at liberalizing and developing the press and mass media and ensuring freedom of speech, fully meeting democratic requirements and standards, have been adopted, thereby creating a solid legal framework in this sphere" [1].

In order to deepen the processes of democratic renewal in our country and enhance the effectiveness of the mass media, the state and society are implementing continuous, comprehensive, and carefully considered measures to support the sector and encourage the professional activities of media representatives. As President Shavkat Mirziyoyev emphasized, "We will take all necessary measures to ensure that freedom of information and the press, citizens' ability to freely express their will, and the openness and transparency of government bodies become defining indicators of the New Uzbekistan" [2].

In recent years, increased attention has been paid to the training of journalists as professional personnel in the mass media sector. The necessary conditions have been created to enhance their knowledge and professional skills. Addressing this issue, President Shavkat Mirziyoyev stated: "…priority attention is being given to the training of highly qualified and patriotic journalists who possess a broad outlook, have a thorough command of foreign languages alongside their native language, and are proficient in information technologies. The fact that hundreds of specialists in journalism are currently being trained at such educational institutions as the University of Journalism and Mass Communications of Uzbekistan, the National University of Uzbekistan, Uzbekistan State World Languages University, Tashkent State University of Oriental Studies, Karakalpak State University, and Bukhara State University is clear evidence of this" [3].

Local newspapers possess distinctive advantages in addressing spiritual and educational issues. While national-level publications tend to focus on matters of nationwide significance, district and city newspapers have the opportunity to provide direct coverage of the everyday lives of local residents, issues affecting mahallas, education, culture, youth, entrepreneurship, historical monuments, and local values. Therefore, studying the activities of the local press in Navoi Region within the context of a digital society and examining its significance in covering spiritual and educational issues are of particular importance. This is because the region has a number of district and city newspapers with a long history, which throughout their existence have consistently covered the social, economic, and cultural life of their respective localities.

The publication of materials on education, culture, history, youth upbringing, mahalla life, veterans, labor veterans, sports, reading culture, and national values in such local periodicals of Navoi Region as "Do‘stlik bayrog‘i", "Xatirchi hayoti", "Yangi Qiziltepa", "Karmana ovozi", "Nurnoma", "Tomdi sharuageri", "Konimex tongi", "Navbahor tongi", "Oltin vodiy", "Uchquduq", "Navoiy ziyosi", and a number of other periodicals demonstrates their spiritual and educational function.

The spiritual and educational function of the local press can be divided into several areas, including the formation of historical memory, the promotion of national and universal values, the advancement of education and enlightenment, and the fostering of social engagement. In this sense, the local press can be regarded as one of society's spiritual and educational institutions. For example, the 600th anniversary of the birth of Mirzo Ulugbek was celebrated in 1994. In honor of this significant anniversary, the pages of the press widely featured articles by numerous scholars and researchers, including P. Musayev's "Sharqni dunyoga tanitgan alloma" [The Scholar Who Introduced the East to the World] [4], Mansur Oltin o‘g‘li's "Ma'rifatli inson, adolatli davlat arbobi, munajjim olim" [An Enlightened Individual, a Just Statesman, and an Astronomer] [5], E. To‘rayev and T. Hazratov's "Sir aytur sayyorlar" [The Planets Reveal Their Secrets] [6], O. Ochilova's "Ulug‘bek ruhini shod aylab" [Honoring the Memory of Ulugbek] [7], as well as many other scholarly and educational articles.

At present, the development of the Internet has fundamentally expanded the capacity of the press to disseminate information. Whereas in the past, newspaper content had to be prepared in printed form and physically distributed in order to reach readers, today such content can be delivered electronically to a large audience within a short period of time. Therefore, newspaper editorial offices are seeking to acquire a range of new skills, including the use of digital platforms, maintaining an active presence on social media, and producing multimedia content, rather than limiting their activities solely to the preparation of printed newspapers.

One of the key characteristics of a digital society is the extraordinary acceleration of information flows. Individuals are now able to receive vast amounts of information from multiple sources simultaneously. While the positive aspect of this process lies in the expanded opportunities for acquiring knowledge and information, its negative aspect is the rapid dissemination of unreliable information and content that may serve various malicious or self-interested purposes. Under such circumstances, information literacy among the population, particularly among young people, has become an increasingly important issue. It is more important than ever to educate individuals not to accept information uncritically, but rather to analyze and evaluate it. The local press can play an important role in this process. Professional local journalism provides the population with verified and responsibly produced information about events and developments in their respective regions. This, in turn, provides an alternative source of information to various rumors and unverified reports circulating on social media. Analytical materials published in newspapers also help readers develop skills such as critical analysis, verification of information, and independent thinking.

In analyzing the activities of local newspapers in Navoi Region, attention can be focused on three main areas: print publishing activities, electronic dissemination of information, and spiritual and educational content. From this perspective, it would be incorrect to regard the digital transformation of the local press in Navoi Region solely as a technological process. This transformation also encompasses changes in content and forms of presentation. In other words, newspaper content is no longer confined to articles printed on paper but may also take the form of electronic texts, photographs, videos, infographics, and social media posts. Under these circumstances, the requirements for journalists' professional competencies are also changing. In addition to traditional journalistic skills, modern journalists need to be proficient in the use of digital technologies, the production of multimedia content, and the dissemination of information across various platforms.

Even in the context of a digital society, the local press retains its spiritual and educational significance. On the contrary, as information flows intensify and the number of information sources continues to grow, the need for professional and reliable local journalism becomes even greater.

Based on the findings of the study, it would be appropriate to put forward the following recommendations: to systematically digitize the historical issues of local newspapers; to establish a unified nationwide electronic database containing information on the history of editorial offices and preserving digital copies of all newspaper issues; to enhance the professional qualifications of local journalists in digital journalism and media literacy; to increase the proportion of spiritual and educational content devoted to youth, history, culture, spirituality, and national values in regional publications; and to strengthen engagement with young people by expanding the presence and activities of the local press on the Internet and social media platforms.

In conclusion, it is appropriate for the local press in a digital society to integrate its traditional functions with new means of communication. The historical experience of local publications in Navoi Region demonstrates that, in addition to meeting society's information needs, the regional press continues to serve as an important institution in shaping its spiritual and educational life, preserving historical memory, and fostering social consciousness.

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THE PSYCHOLOGICAL IMPACT OF EDUCATIONAL MOTIVATION AND FAMILY VALUES ON PERSONALITY DEVELOPMENT

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Annotation. *This article analyzes the role of educational motivation and family values in the personal development of learners from psychological, pedagogical, and socio-philosophical perspectives. The study examines how family environment, value systems, and parental attitudes influence students' motivation for learning and their educational outcomes. Particular attention is paid to the interconnection between education and upbringing, as well as the social significance of family values in shaping a motivated, responsible, and socially active individual. The findings emphasize the importance of strengthening cooperation between family and educational institutions in order to enhance learning motivation and holistic development of learners.*

Keywords: *educational motivation, family values, upbringing, personality development, psychological and pedagogical approach, socio-philosophical analysis*

Introduction. Modern educational models are based on the prioritization of the individual in education and on increasing the role of students in the educational process. The success of education is directly related to students' desire to learn and acquire new knowledge. According to the results of numerous studies conducted worldwide, status-related motives (obtaining a prestigious profession and possessing a higher education diploma that provides an advantage in the labor market) have been identified as primary factors contributing to students' professional orientation [1]. Two of the most widely used theories in contemporary foreign research on educational motivation are the hierarchical self-determination theory and the Goal Achievement Theory. These theories provide a foundation for research on learning motivation, serve as a basis for developing instruments to measure educational motivation, and at the same time focus on different aspects of this concept.

While self-determination theory focuses on the reasons that stimulate educational activities, achievement goal theory focuses on the goals toward which educational activities are directed [2]. Personal development is a gradual process of intellectual, emotional, social, and moral improvement. Psychological development is shaped not only by biological factors but also by the social environment, particularly the influence of the family and the education system.

As Anderman writes, this concept refers to the goals that students set for themselves while performing educational tasks (personal goals), as well as their perceptions of the goals established by teachers (goal structures). Within this concept, achievement goal orientations are considered among the most widely studied variables and are expressed through two main concepts.

In the modern education system, the comprehensive development of the student's personality is considered one of the primary priorities. The intellectual, social, and spiritual development of an individual largely depends on their educational motivation. Motivation, in turn, is closely associated with the family environment and the system of family values.

The family is the primary and most important institution in the formation of personality. It is within the family that a child acquires their first social experience, internalizes values, and develops mechanisms of self-evaluation. Therefore, studying the interaction between educational motivation and family values represents a relevant scientific problem.

Educational motivation and family values are important psychological factors in personality development. A healthy emotional atmosphere within the family, a positive attitude toward education, and a democratic parenting style contribute to the formation of intrinsic motivation in children. This, in turn, supports their intellectual potential, social activity, and personal development.

Therefore, strengthening cooperation between the family and educational institutions and introducing innovative pedagogical approaches aimed at developing motivation are of great importance in the education system. The harmony between educational motivation and healthy family values can lead to the following long-term outcomes:

- Professional success
- Leadership potential
- Sustainable self-development
- A positive attitude toward life

Conversely, a lack of family support may lead to difficulties in social adaptation and low self-esteem.

Students' motivation is also influenced by their value orientations. One of these orientations is adherence to the ideas of individualism and collectivism. It is well known that the modern education system is shaped by both collectivist values (group work and the ability to collaborate in education) and individual values (a competitive educational environment and individualized learning). This raises the question: which model of value formation among students is the most effective for their learning motivation and academic achievement?

Many researchers have repeatedly noted the rapid formation of a Western mentality among students. Such tendencies are not always positively evaluated by researchers studying GDA (Gaussian Discriminant Analysis), as they may, in some cases, create conditions for the development of directive and antisocial practices among students. These circumstances demonstrate the need to investigate the relationship between value orientations, students' motivation, and their academic achievements [3].

The presented concepts of motivation and their empirical examination require further analysis and adaptation. The desire to acquire knowledge, achieve high results, and independently construct knowledge develops along a trajectory of growth under competitive conditions.

It is also possible to consider the positive impact of assessment on students' learning outcomes. When developing assessment criteria, rating systems, and assessment methods, it is necessary to take into account important aspects of knowledge evaluation. These systems should be designed to motivate students, encourage them to acquire new knowledge, and guide them toward achieving high results. In addition, considering students' academic performance in the contemporary labor market may provide them with an advantage when obtaining new employment opportunities [4].

Identifying students' motivation and value orientations helps assess their attitudes toward education. This can be useful in the development of educational institutions and learning centers. In our view, individualistic values, such as competitiveness and independence, contribute more significantly to students' academic achievements and success.

It is particularly important to develop personal values among young people, especially university graduates. In the context of increasing competition in the labor market, students should be taught to improve their knowledge and skills and to recognize their own value and potential.

Drawing on the experience of American universities, it is necessary to increase students' interest in knowledge and clearly define assessment criteria. All of these factors influence students' achievements. Developing students' self-confidence also has a positive impact on their academic performance. Creating a supportive educational environment and implementing fair incentive systems are important tasks of modern higher education.

According to current data, university students are situated between adolescence and adulthood, a period that reflects the dynamics of major life events. Individuals pursuing higher professional education constitute a distinct social group. During this period, personal development is a highly contradictory process complicated by social and personal conflicts arising under the influence of various objective and subjective factors [5].

Personal development takes place in the process of addressing issues of a pedagogical nature. During this process, students develop an understanding of their new social status, which encompasses physical, economic, and spiritual dimensions. At the same time, this process of growth encounters strict limitations in terms of time and material resources under real-life conditions.

During this period, contradictions may arise between the desire for independence and relationships with representatives of the older generation. There are also contradictions between students' learning methods and university requirements, as well as between the quantity and quality of acquired knowledge and the lack of sufficient experience and time to apply this knowledge in practice.

Theoretical analysis shows that educational activity at the university, together with the characteristics specific to the student age group, functions as the leading activity of students. This process includes a number of specific characteristics associated with belonging to a particular subculture and having professional interests. Motivation is an important determining factor in making an individual and responsible choice of a particular career.

The problem of motives and motivation has been studied in world psychology from various theoretical perspectives. Motivation refers to a set of psychological causes that explain human behavior, its connection, direction, and activity. The concept of motivation has been studied by a number of scholars in psychology. For example, Abraham Maslow developed the hierarchy of human needs theory. According to this theory, the need for self-actualization represents one of the highest levels of motivation. Education, in turn, serves as a means of satisfying this need.

Furthermore, Frederick Herzberg proposed the Two-Factor Theory of Motivation, in which intrinsic factors (interest and a sense of achievement) and extrinsic factors (incentives, grades, and rewards) are distinguished. Educational motivation can be divided into two types:

1. Intrinsic motivation – a learner's internal interest in acquiring knowledge.
2. Extrinsic motivation – motivation formed through grades, rewards, or parental control.

Intrinsic motivation is considered more stable and effective. In the context of globalization, the quality and effectiveness of education have become important factors in the development of every society. The success of the educational process directly depends on students' motivation to learn. Motivation is a combination of internal and external forces that encourage an individual to engage in a particular activity and ensure their pursuit of a specific goal.

The family represents the initial stage of personal development, and the values formed within the family become firmly established in the child's consciousness. Family values determine a child's attitude toward knowledge, sense of responsibility, and social activity. Therefore, studying the relationship between educational motivation and family values is a relevant scientific problem.

According to the scientific literature, motivation (derived from the Greek word *motif* and the Latin *moveo*, meaning "to move" or "to set in motion") is the process of developing a strong desire to achieve a particular goal, generating enthusiasm, and mobilizing the necessary effort to accomplish it. The concept of motivation is interpreted as a set of motives, arguments, evidence, justifications, reasons, or causes that lead to the emergence of a particular action or activity. In scientific works devoted to human motivation, it is emphasized that "if human life is understood as continuous movement forward toward development, then life can be described as a process of constantly overcoming new obstacles on the way toward self-improvement and achieving the highest possible level of personal growth. In this process, understanding the meaning of each action performed by an individual plays a fundamental role."

It should also be emphasized that the development of motives, the emergence of new motivational information, and changes in the activity environment occur as a result of transformations within the sphere of activity. The mechanism of motivation manifests itself as a restructuring of personality traits and an activation of the process of their development. At the same time, the process of human development is influenced by the gradual or rapid changes in the activity environment and conditions, as well as by factors such as the improvement and stabilization of motives. The essence of the above considerations lies in the re-education of an individual through work activities and the formation of certain personal qualities.

In this context, activity represents an active situation in which an individual gradually moves away from psychological states associated with existing needs and interests and subsequently develops new interests, needs, and aspirations. As a result, the nature and forms of motives are transformed. Motives are specific reasons that stimulate activity and are complexly interconnected with needs: behind one motive there may be various needs, while conversely, different motives may arise from one particular need. Sometimes a motive is confused with a need or a goal.

However, a need is a desire unconsciously directed toward eliminating a state of discomfort. A goal is a conscious intention through which an individual carries out a planned action. For example, hunger is a **need**, the desire to consume food is a **motive**, whereas the food toward which a person instinctively reaches can be considered the **goal**. Motives arise, develop, and become established as a result of needs. At the same time, motives possess a relatively independent motivating force.

Needs determine the strength and stability of motives. Even when different individuals have the same need, they may possess different motives. The motives underlying human behavior and activity are unique and changeable. Their development depends on the individual's surrounding environment and the influence of purposeful educational and developmental processes. The relationship between needs and motives is manifested through human behavior in the process of carrying out activities.

For example, studies of the preparation of students for professional activities through the use of information and communication technologies (ICT) have shown that, compared with traditional classes, the use of modern technologies contributes to the stronger development of

students' motivation and interest in learning. As motives develop and become more stable, they create a foundation for strengthening needs.

Until the twentieth century, the dominant view was that people would work better if they were offered the opportunity to earn more money. In other words, motivation was primarily understood as offering financial rewards in exchange for the effort expended.

Negative motivation is a type of motivation based on an individual's negative interests or the desire to avoid undesirable consequences. For example: "If I do not do something wrong, my parents will not scold me." Stable motivation is motivation based on an individual's natural and fundamental needs.

Unstable motivation is a type of motivation that requires continuous external support. Examples include quitting smoking, losing weight, and similar behaviors. When a person finds themselves in a difficult situation, whether they behave appropriately or inappropriately is influenced by several factors: their level of intellectual development, other constantly changing personal characteristics, the structural organization and culture of the institution, and the intensity of moral behavior. Individuals with a low level of moral culture are less likely to engage in inappropriate behavior when they are influenced by rules, law enforcement officers, workplace codes of conduct, and other external regulations.

Contradictory and competing rules of personal culture may sometimes be violated as a result of collective structures and cultures that create conditions allowing unethical actions. As mentioned above, a distinctive characteristic of motivation is its strength and power. This affects not only the level of human activity but also its success. The manifestation of this activity, particularly its effectiveness, is associated with the strength and stability of motivation. When a person expresses a motivational attitude in a particular situation, that is, "here and now," their persistence increases and the activity is organized more effectively.

M. Winterbottom (M. R. Winterbottom, 1958) demonstrated that highly positively motivated children become increasingly persistent in performing tasks, whereas this relationship is less evident among adults (J. Atkinson and G. Litwin, 1960) or may be completely absent (E. French and F. Thomas, 1958). As H. Heckhausen (1986) demonstrated, for strong achievement motivation, it is important to plan for the future over a relatively long period. Social norms play an important role in both positive and negative motivation. The term "social norms" is generally used to refer to standards and rules (both prescriptive and prohibitive) that members of a group or society are expected to follow. Society requires individuals to comply with these requirements and adhere to these rules.

Respect for these norms is reflected in behavior through which an individual becomes integrated into and identifies with other members of a group or social community. At the same time, external norms may have different internal meanings for different individuals. For example, as D. D. Stamatina (1977) demonstrated, there are at least three motives for consistently honest behavior that reflect the level of social maturity of individuals. First, some individuals justify such behavior primarily through practical benefits, since dishonest people lose trust, are not respected, and so forth. Second, some individuals act honestly because of the needs and expectations of society, although they may sometimes regard such behavior as self-sacrifice. Third, some individuals perceive honesty as an intrinsic value, regardless of whether they fully recognize its personal and social significance.

Social norms of behavior are not automatically followed. They must become internalized; according to Schwartz, they need to become "personal norms." In addition, there are a number of

factors that reduce their imperative nature. In particular, J. Darley and B. Latané (1968), in their research on social inhibition in providing assistance during emergencies, proposed that this phenomenon manifests itself in three distinct ways.

Individuals who possess negative impulses and tend to act despite unfavorable circumstances, even at their own expense, are referred to as passionaries. Individuals characterized by positive, life-affirming impulses are referred to as subpassionaries.

According to L. Gumilyov, when passionaries undergo decline, they are replaced by subpassionaries. They are regarded as “simple” or “backward” individuals, and their increasing dominance is considered an indication that an ethnos is approaching its decline, since little remains in them beyond instinctive impulses.

RESEARCH METHODOLOGY.

The present study employed a mixed-method research design combining quantitative and qualitative approaches to examine the relationship between students’ educational motivation, family values, and personality development. The quantitative component was used to identify the level and structure of students’ educational motivation and to determine the relationship between motivation and family values. The qualitative component was aimed at obtaining a deeper understanding of students’ perceptions of family support, educational goals, personal development, and factors influencing their motivation to learn.

The research was conducted based on the assumption that educational motivation is not an isolated psychological phenomenon but is influenced by a complex interaction of personal, social, educational, and family-related factors. Particular attention was paid to the role of the family environment, emotional support, value orientations, parental attitudes toward education, and students’ perceptions of their future professional development.

The methodological framework of the study was based on contemporary psychological and pedagogical approaches to motivation, self-determination, achievement motivation, value orientations, and personality development. The theoretical foundation included principles derived from self-determination theory, achievement goal theory, Maslow’s hierarchy of needs, and Herzberg’s two-factor theory of motivation.

The empirical study involved university students representing different academic years and areas of study. Participants were selected in order to obtain information about the characteristics of educational and professional motivation at different stages of higher education.

The sample included students who voluntarily agreed to participate in the research. Participation was anonymous, and the respondents were informed about the general purpose of the study. Personal information that could directly identify individual participants was not collected.

The inclusion of students from different academic years made it possible to examine possible differences in motivation, value orientations, and personality development depending on the stage of university education. Particular attention was paid to the transition from initial adaptation to university life toward greater academic and professional independence.

The main independent variables of the study were family values and the characteristics of the family environment. These included emotional support, parental attitudes toward education, family cohesion, communication, responsibility, mutual respect, and the importance attached to education within the family.

Educational motivation was considered as a key psychological variable. It was analyzed through intrinsic and extrinsic motivational components. Intrinsic motivation was associated with students’ interest in knowledge, desire for self-development, satisfaction derived from learning,

and the desire to master professional competencies. Extrinsic motivation included grades, rewards, parental expectations, social recognition, career opportunities, and material benefits.

Personality development was considered as the main outcome variable and was assessed through indicators of intellectual, social, emotional, motivational, and professional development.

At the first stage, the relevant scientific and theoretical literature on educational motivation, family values, self-determination, achievement motivation, and personality development was analyzed. This stage made it possible to identify the major theoretical approaches and formulate the conceptual framework of the research.

At the second stage, the empirical research instruments were selected and adapted to the characteristics of university students. The questionnaire and psychological assessment procedures were reviewed to ensure their relevance to the objectives of the study.

At the third stage, the empirical data were collected from the participating students. Respondents completed the questionnaires individually. They were provided with instructions concerning the purpose and procedure of the research. Participation was voluntary, and respondents were encouraged to provide sincere answers.

At the fourth stage, the collected data were systematized and statistically processed. The obtained indicators were compared according to the main variables of the study. Particular attention was paid to the relationship between family support, educational motivation, value orientations, and personality development. At the final stage, the empirical findings were interpreted in accordance with the theoretical assumptions of the research. The results were used to formulate conclusions concerning the psychological relationship between family values and educational motivation.

The quantitative data were analyzed using descriptive and inferential statistical methods. Descriptive statistics were used to determine the distribution of responses, mean values, percentages, and levels of the main indicators.

Correlation analysis was used to determine the strength and direction of relationships between family values, family support, educational motivation, and personality development. Where appropriate, comparisons were made between students with different levels of intrinsic and extrinsic motivation.

The analysis also focused on identifying whether students who reported higher levels of family support demonstrated higher levels of intrinsic educational motivation, academic engagement, self-confidence, and professional orientation.

Qualitative responses were analyzed through thematic analysis. Recurring themes related to family influence, educational goals, academic difficulties, professional aspirations, and personal development were identified and systematized.

To improve the reliability of the findings, several methodological principles were followed. The research instruments were selected according to the objectives of the study and the psychological characteristics of the participants. The use of several complementary methods made it possible to compare information obtained from different sources and thereby increase the validity of the conclusions.

The questionnaire items were formulated in a clear and understandable manner. Before the main data collection, the instruments were reviewed to identify potentially ambiguous or difficult-to-understand questions. The obtained empirical indicators were interpreted in conjunction with the theoretical framework rather than being considered in isolation.

Ethical principles were observed throughout the research process. Participation was voluntary, and respondents were informed about the general purpose of the study. The anonymity and confidentiality of participants were ensured. The collected information was used exclusively for scientific and research purposes.

Participants were not required to provide personally identifying information. They were also informed that they could decline to answer individual questions or withdraw from participation without any negative consequences.

The methodological framework of the research was based on the principle that students' educational motivation develops through the interaction of individual psychological characteristics and the social environment. Family values were considered an important component of this environment because they influence students' attitudes toward education, responsibility, achievement, independence, and professional development.

The study assumed that a supportive family environment contributes to the development of intrinsic educational motivation. Emotional support, mutual respect, positive communication, and a favorable attitude toward education may increase students' confidence and willingness to overcome academic difficulties. In contrast, insufficient family support, excessive parental pressure, or contradictory value orientations may contribute to the predominance of extrinsic motivation and reduce students' academic engagement.

The methodology was designed to identify the psychological mechanisms through which family values influence students' educational motivation and personality development. It was expected that students who experience a supportive and emotionally positive family environment would demonstrate higher levels of intrinsic motivation, greater responsibility for their learning, stronger professional aspirations, and more developed self-confidence.

The study also aimed to determine the relative contribution of intrinsic and extrinsic motivation to students' academic engagement. Particular attention was given to the assumption that intrinsic motivation is more stable and sustainable because it is associated with personal interest, self-development, and the internal value of learning.

The findings obtained through this methodology can provide a basis for developing psychological and pedagogical recommendations aimed at strengthening cooperation between families and educational institutions, improving students' educational motivation, and supporting their personal and professional development.

Level of intellectual development. Scientific research indicates that intellectual development consists of three stages, each of which, in turn, includes two sub-stages. At each stage of development, individual moral decision-making becomes progressively less dependent on external influences, and the individual begins to demonstrate greater personal independence.

In accordance with contemporary approaches, the development of specific educational and professional motivation, and to a large extent the success of professionalization as an aspect of student personality development, depends on the characteristics of educational and professional motivation associated with solving educational and professional problems. At the same time, a review of scientific and literary sources makes it possible to examine these relationships in greater depth.

According to the available literature, the problem of personality development under the influence of educational and professional motivation remains insufficiently studied for its effective application in addressing this issue. Due to the existence of this research problem, the empirical part of the study was aimed at achieving the following objective: identifying the characteristics of

students' personal development under the influence of their educational and professional motivation.

To achieve this objective, the study examined the characteristics of educational and professional motivation among students from different academic years, as well as the relationship between students' educational and professional motivation and their value orientations, aspirations for achievement, personal problems, organizational abilities, and the level of development of a number of adaptive and characterological characteristics.

Educational motivation and family values are interrelated psychological factors in personality development. A healthy emotional environment created by the family and a positive attitude toward education contribute to the formation of intrinsic motivation in children and support their intellectual, social, and personal development.

Educational motivation and family values are important factors in personality development. The empirical findings confirmed the existence of a significant relationship between family support and intrinsic motivation. Cooperation between the family and the educational institution is of great importance for the intellectual and social development of the individual.

Educational motivation and family values are closely interconnected. The family shapes and reinforces an individual's attitude toward education. A loving, supportive, and spiritually enriched family environment is an important factor in the development of intrinsic motivation. Therefore, in the educational process, it is necessary not only to strengthen the role of the educational institution but also to enhance cooperation with the family.

CONCLUSION.

Motivation is an important determining factor in making an individual and responsible choice of a particular career. The problem of motives and motivation has been studied in world psychology from various theoretical perspectives. In both Western and Eastern countries, distinctive psychological schools have emerged, incorporating ideas and approaches that differ in terms of their scientific positions and conceptual foundations.

Motivation is a set of factors that encourages an individual to engage in active behavior and represents a dynamic process of psychological and physiological regulation of behavior. It includes initiative, direction, organization, and support. Motivation refers to the explanation of human behavior and its dependence on questions such as "Why?", "For what purpose?", and "In what sense?" Motivation represents a set of psychological causes that explain human behavior, its relationships, direction, and activity.

Motives are the reasons that determine the choice of the direction of behavior. Taken together, they form the orientation of an individual's personality and serve as a means of regulating human behavior and activity.

These include emotions, desires, and interests. Attitudes (set) refer to orientation or direction and describe an individual's state of readiness to relate to people or objects in their surrounding environment in a particular way, to perceive and sense them, evaluate them, and perform a certain action toward them.

Directed activity represents a set of actions through which a subject is able to actively navigate and find an appropriate course of action in a particular situation.

Orientation is a stable system of motives that directs an individual's behavior and activity toward a particular path and toward the achievement of a goal, regardless of specific circumstances. It is characterized by basic, leading, and dominant needs, interests, inclinations, beliefs, worldviews, and higher ideals.

Behind every motive lie the needs of the individual. Human needs, goals, desires, and interests represent important components of an individual's psychological state. These aspects were identified through addressing a number of problems related to their study.

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ADAPTING ACADEMIC TEXTS GENERATED BY ARTIFICIAL INTELLIGENCE TO A TASK-BASED LANGUAGE TEACHING APPROACH IN TEACHING ENGLISH AS A FOREIGN LANGUAGE IN GENERAL SECONDARY SCHOOLS IN UZBEKISTAN: A LINGUISTIC AND METHODOLOGICAL ANALYSIS OF TEACHERS' DECISION-MAKING

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Abstract. *Today, the integration of artificial intelligence (AI) technologies into the educational process is creating new opportunities in foreign language teaching methodology, particularly in the teaching of English. Generative AI tools enable teachers to create texts, tasks, and instructional materials for learners at different proficiency levels within a short period of time. However, AI-generated texts do not always fully correspond to learners' linguistic proficiency, age, cultural background, or the methodological objectives of a lesson. Therefore, teachers' decisions in selecting, editing, simplifying, and transforming AI-generated materials into task-based activities are of particular academic significance. This article examines the adaptation of AI-generated academic texts to the Task-Based Language Teaching (TBLT) approach in the context of teaching English as a foreign language in general secondary schools in Uzbekistan. In addition to the lexical, grammatical, syntactic, and discourse features of the texts, the study also considers teachers' methodological decision-making processes. The findings indicate that, rather than directly incorporating AI-generated texts into classroom instruction, pedagogically purposeful adaptation and modification of such materials are essential for the effective implementation of TBLT principles.*

Keywords: *artificial intelligence, generative AI, English language, EFL, Task-Based Language Teaching, TBLT, academic text, teacher decision-making, linguistic adaptation, methodological adaptation, Uzbekistan.*

In recent years, the rapid development of artificial intelligence (AI) In recent years, the rapid development of artificial intelligence (AI) has brought about significant changes in the education system. In particular, the growing popularity of generative AI tools such as ChatGPT has introduced new opportunities into the process of preparing instructional materials. Texts, questions, dialogues, and tasks that previously required teachers considerable time and effort to prepare can now be generated within a few minutes with the assistance of AI. This capability is of considerable practical importance in teaching English as a foreign language (EFL), particularly for teachers working with learners at different proficiency levels.

At the same time, treating AI-generated texts as ready-to-use instructional materials is not always methodologically appropriate. Although an AI-generated text may be grammatically accurate, its vocabulary may exceed the learners' proficiency level, its sentences may have overly complex structures, or its content may be disconnected from the learners' real-life experiences. Moreover, the mere availability of a text does not, in itself, ensure effective language learning. The

text should engage learners in meaningful communicative activities and encourage them to accomplish a specific task.

It is precisely at this point that the Task-Based Language Teaching (TBLT) approach becomes particularly important. In TBLT, language learning is not limited to mastering grammatical rules or memorizing new vocabulary. Learners are expected to use language while performing meaningful and goal-oriented tasks. Therefore, the pedagogical value of an AI-generated text depends not only on how well-written or grammatically accurate it is, but also on its capacity to engage learners in meaningful communicative tasks.

In the context of teaching English in Uzbek schools, this issue is particularly relevant. The language proficiency levels, cultural experiences, educational needs, and existing curricula of local learners differ to some extent from those found in international educational contexts. Therefore, the teacher plays a central role in adapting AI-generated English texts to the local pedagogical context.

Generative artificial intelligence is creating a range of new opportunities in English language education. Teachers can use AI tools to generate texts on specific topics, adapt them to different proficiency levels, formulate questions, create dialogues, or develop communicative tasks. For example, when prompted to generate a text on the topic of “environmental problems” for B1-level learners, AI can quickly produce a text of an appropriate length along with corresponding comprehension questions.

However, the fact that AI-generated materials can be produced quickly and easily does not mean that they are methodologically sound. Teachers need to evaluate such materials critically. First, it is necessary to consider whether the text is appropriate for the learners’ age and language proficiency level. Second, attention should be paid to whether the lexical items are consistent with the learners’ existing vocabulary or whether the text contains an excessive number of unfamiliar words. Third, the extent to which the content is relevant to the learners’ cultural and social experiences should be determined.

Therefore, it is more appropriate to view AI not as a replacement for the teacher, but as a technology that supports teachers’ pedagogical decision-making. The quality of the final instructional material depends largely on how teachers select, evaluate, and adapt it.

The Task-Based Language Teaching Approach and Its Key Features

Task-Based Language Teaching (TBLT) is an approach based on teaching language through communicative tasks. Within this approach, the concept of a “task” is central. A task refers to a real-life or real-life-like communicative activity that requires learners to use language in order to achieve a particular outcome.

For example, asking learners to “Write five sentences about environmental problems” may constitute a conventional writing exercise. In contrast, a task such as “Your school wants to reduce plastic waste. Work in groups and create a three-point plan to solve the problem” encourages learners to discuss a problem, express their opinions, make suggestions, and reach decisions. This type of activity is more closely aligned with the communicative nature of TBLT.

Within TBLT, the function of a text also changes. A text is not merely material provided for reading comprehension; rather, it becomes a resource that prepares learners for subsequent communicative activity. From this perspective, adapting an AI-generated text to TBLT should not be limited to grammatical or lexical simplification alone.

One of the first important decisions a teacher needs to make is to determine the linguistic complexity of the text. AI-generated academic texts often contain relatively complex syntactic constructions, abstract nouns, and academic lexical items. Although such texts may be appropriate

for university students, they are likely to pose difficulties for EFL learners in general secondary schools.

Linguistic adaptation can be carried out at several levels. First, lexical items are reviewed. Infrequent words or words that are above the learners' proficiency level can be replaced with more commonly used equivalents. However, removing every complex word is not necessarily appropriate. Some new lexical items may be essential to achieving the objective of the task. In such cases, the teacher can make these items comprehensible through context or pre-teach them before the task.

Second, syntactic complexity is controlled. Very long sentences can be divided into shorter ones, while complex sentences can be restructured according to the learners' proficiency level. For example, a sentence generated by AI such as "Although many young people are aware of the negative consequences of excessive social media use, they continue to spend several hours a day on social networking platforms" may be difficult for some B1-level learners. Rephrasing it as "Many young people know that social media can have negative effects. However, they still spend several hours a day online" reduces the linguistic load while preserving the original meaning.

Third, the cohesion and coherence of the text are examined. Even when an AI-generated text is grammatically accurate, the connections between ideas may sometimes appear unnatural. The teacher should ensure that the text is presented to learners in a clear, logical, and comprehensible sequence.

Teachers' Methodological Decisions

When adapting an AI-generated text to TBLT, the teacher's methodological decision may be even more important than linguistic editing. This is because the teacher does not simply simplify the text; they also determine what kind of communicative task will be organized on the basis of the text

For example, suppose that AI generates a text on the topic of "Healthy Lifestyle." The teacher may ask learners to read the text and then provide the task "Answer the following questions." This activity is closer to a traditional reading comprehension exercise. From a TBLT perspective, however, the teacher could use the text as a basis for designing a task such as "Create a healthy weekly plan for a teenager and explain your choices to another group." In this case, the text serves as a resource for communicative activity.

Therefore, the teacher's central question should not be "Is this text well written?" but rather "What kind of language activity does this text lead learners to engage in?"

The teacher should also take the level of task complexity into consideration. The same text can be transformed into different types of tasks for different groups of learners. For lower-level learners, a task involving identifying key information and speaking in pairs may be appropriate, whereas higher-level learners may be given tasks that require them to analyze a problem, engage in discussion or debate, or make decisions.

Adapting AI-Generated Materials to the Cultural Context of Uzbek Schools

Cultural context is also an important factor in adapting AI-generated materials for schools in Uzbekistan. Artificial intelligence may generate texts based on general knowledge drawn from different countries and cultural contexts. As a result, some topics or examples may seem unfamiliar or insufficiently engaging to Uzbek learners.

For example, an AI-generated text on the topic of "school life" may describe school systems, school uniforms, or students' daily lives in English-speaking countries. The teacher does

not necessarily need to replace such a text entirely. Instead, it can be used as a basis for comparing the situations described in the text with real-life contexts in Uzbek schools. A question such as "How is school life in the text different from school life in Uzbekistan?" encourages learners not only to use the target language but also to engage in cultural comparison.

This approach is particularly useful for TBLT because it provides learners with opportunities to express their ideas in English about topics that are meaningful and relevant to their own experiences.

The Linguistic and Methodological Nature of Teachers' Decisions

In the process of adapting an AI-generated text, teachers make several decisions simultaneously. They may replace words, shorten sentences, remove certain sections, or add new information to the text. At the same time, they make methodological decisions about whether to organize individual, pair, or group work, identify a problem, facilitate discussion, or require learners to produce a final outcome based on the text.

Therefore, it is not sufficient to characterize the teacher's activity simply as "text editing." Rather, this process can be understood as pedagogical mediation—the process of transforming a generic AI-generated material into a pedagogical resource that is appropriate for a particular class and a specific learning objective.

For example, a teacher may remove 20 percent of an AI-generated text. At first glance, this may appear to be a simple act of shortening. However, the particular sections the teacher chooses to remove may reveal their methodological intentions. If the teacher removes unnecessary background information while retaining the central problem that learners are expected to discuss, this decision can be understood as being closely connected to the communicative objectives of TBLT.

The following sequence can be used to adapt an AI-generated text for classroom instruction based on the TBLT approach:

1 — **Identifying needs.** The teacher determines the lesson objectives, learners' language proficiency levels, and their needs in relation to the topic.

2 — **Generating the initial text using AI.** The topic, length, language level, and target audience of the text are clearly specified.

3 — **Linguistic analysis.** The vocabulary, grammar, syntax, text length, and level of comprehensibility are examined.

4 — **Methodological adaptation.** A communicative and goal-oriented task is developed on the basis of the text.

5 — Cultural adaptation. The content and cultural appropriateness of the text for learners in Uzbekistan are evaluated.

6 — **Classroom implementation and piloting.** Learners' participation, difficulties, and communicative engagement are observed.

7 — Revision. Based on the outcomes of the lesson, the text and tasks are further refined.

This model does not position AI technology and teachers' professional expertise as opposing forces. Rather, it views technology as a tool that supports teachers' methodological decision-making.

Problems and Limitations

There are several challenges associated with the use of AI-generated materials. First, artificial intelligence may not always provide factually reliable information. Therefore, teachers need to verify the factual accuracy of the information contained in the materials.

Second, although an AI-generated text may be grammatically accurate, it may not always perfectly reflect natural communicative language. Teacher supervision is particularly important when providing learners with dialogues and everyday expressions that are necessary for real-life communication.

Third, if teachers do not have sufficient methodological training in the use of AI tools, they may use the technology merely as a text-generation tool. This may result in the underutilization of AI's broader educational potential. Therefore, teachers need to be prepared not only from a technical perspective but also from pedagogical and critical perspectives.

The use of AI-generated texts in English language lessons should be viewed not merely as a technological innovation but also as a transformation in teachers' professional practice. In traditional educational settings, teachers often rely on ready-made textbooks, teaching materials, and resources they have developed themselves. Generative artificial intelligence, however, enables teachers to create new materials within a short period of time, modify existing texts, and prepare multiple versions of the same topic for learners at different proficiency levels. As a result, the teacher's primary role is increasingly shifting from simply creating materials to selecting, evaluating, and pedagogically adapting them.

In this process, teachers' decisions depend on several factors. First and foremost, learners' language proficiency levels need to be taken into account. For example, while a text on the same topic for A2-level learners should consist of short and simple sentences, B1- or B2-level learners may be exposed to more complex syntactic structures and abstract concepts. Therefore, the concept of an "AI-generated text" alone is not sufficient. What matters is who the text is intended for and for what pedagogical purpose it has been created.

In the process of adapting an AI-generated text, teachers generally make three types of decisions: During the adding process, examples, explanations, or information related to the local context may be incorporated to facilitate learners' comprehension. During the removing process, sections that are unnecessary or excessively complex for learners are shortened or eliminated. During the modifying process, vocabulary, grammatical structures, sentence length, or the overall organization of the text are revised.

Such decisions should not be regarded as merely grammatical editing. For example, a teacher may replace academic expressions such as "significant consequences," "environmental sustainability," or "individual responsibility" in an AI-generated text with simpler words. This decision is made by taking the learners' existing vocabulary knowledge into consideration. At the same time, if these expressions represent the primary learning objectives of the lesson, it may be more appropriate to explain them through context rather than remove them. Thus, linguistic adaptation is closely connected with the teacher's methodological objectives.

Authenticity and Communicative Value of AI-Generated Texts

Authenticity plays an important role in the TBLT approach. Learners should use language not only through grammatical exercises but also in contexts that resemble real-life communicative situations. Therefore, when evaluating an AI-generated text, it is necessary to consider not only its grammatical accuracy but also its communicative value.

For example, AI may generate a highly polished academic text on the topic of "Healthy Lifestyle" for learners. However, if the text is used only for reading and answering comprehension questions, its communicative potential remains limited. The teacher can transform the text into a task that facilitates the exchange of ideas, decision-making, or problem-solving among learners.

Using information from the text, learners may develop a healthy lifestyle plan, present it to another group, and justify their choices.

In such a situation, the text is not the ultimate objective of the lesson but rather a means of accomplishing a communicative task. This is directly connected to one of the fundamental principles of TBLT.

The purposeful use of AI tools can also contribute to the development of learners' critical thinking skills. Instead of presenting an AI-generated text as "correct and ready-made knowledge," the teacher can ask learners to examine and evaluate its content.

For example, learners may be provided with a short AI-generated article and asked to identify its main ideas, verify the facts presented, evaluate the author's position, and express their own opinions based on the text. In this process, learners not only use English but also develop the ability to evaluate information critically.

This is particularly important in contemporary educational contexts, as learners are exposed to vast amounts of information through the internet and digital technologies. Therefore, the purpose of English language lessons should not be limited to teaching linguistic forms and structures; they should also prepare learners to engage with digital information responsibly.

Teachers' AI literacy is of critical importance for the effective use of artificial intelligence in education. AI literacy is not limited to knowing how to operate AI technologies. It also encompasses an understanding of the capabilities and limitations of AI, the ability to critically evaluate AI-generated materials, identify inaccurate or unreliable information, and adapt AI-generated content to specific pedagogical objectives.

For example, a teacher may prompt AI to "Write a text about ecology for B1-level learners." However, to achieve an effective result, it is necessary to specify the topic, text length, approximate vocabulary level, grammatical structures, and communicative objective. The teacher is also responsible for reviewing the AI-generated response and revising it when necessary.

From this perspective, future teachers should not be trained merely as users of ready-made AI materials, but rather as professionals capable of creating pedagogical materials in collaboration with AI.

The use of AI-generated materials in Uzbek schools can be particularly beneficial in classes where learners have different levels of English proficiency. It is natural that not all learners in the same classroom will have the same level of English. In such situations, teachers can generate texts at different proficiency levels based on the same topic and provide tasks appropriate to each group.

For example, on the topic of "Uzbekistan and Tourism," a simple descriptive text can be prepared for a beginner-level group, an informational text about tourist destinations for an intermediate-level group, and a discussion-oriented text addressing the economic and environmental impacts of tourism for an advanced-level group. Subsequently, each group can complete a communicative task appropriate to its proficiency level.

Such an approach facilitates the implementation of differentiated instruction. Most importantly, learners are not required to work with materials that are excessively above or below their proficiency level. At the same time, the teacher can address diverse learning needs within the framework of the same lesson.

AI-generated academic texts have considerable potential for teaching English in general secondary schools in Uzbekistan. However, the mere availability of an AI-generated text does not automatically make it an effective instructional material. Its actual pedagogical value depends on

how the teacher evaluates the text, adapts it linguistically, and transforms it into a meaningful communicative task.

From a TBLT perspective, the teacher should view the text not merely as reading material but as a resource that leads learners toward communicative activities resembling real-life language use. In this process, in addition to lexical and grammatical simplification, attention should also be given to the purpose of the task, learners' needs, the cultural context, and the expected communicative outcome.

Thus, the key question for the future of English language education will be less about "Will AI replace the teacher?" and more about "How can teachers transform AI-generated materials into effective pedagogical resources?" It is precisely teachers' professional knowledge, critical thinking, and methodological decision-making that can transform a generic AI-generated text into a meaningful and effective language learning experience for particular learners.

Conclusion

Overall, although generative artificial intelligence offers significant opportunities in the process of teaching English, its effectiveness depends not on the technology itself, but on the pedagogical purposes for which it is used. AI can generate a text within a short period of time; however, determining how appropriate that text is for a particular class, group, or individual learner requires teachers' professional competence.

Therefore, the integration of AI and TBLT does not diminish the role of the teacher. On the contrary, it strengthens the teacher's importance as a methodological expert. The teacher critically evaluates AI-generated materials, adapts them linguistically and culturally, develops communicative tasks, and aligns them with learners' actual needs. Consequently, AI-based educational materials can acquire genuine pedagogical value only when technology and human expertise work together.

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ASSESSMENT-INTEGRATED ADAPTIVE SOFTWARE FOR DEVELOPING LOGICAL THINKING OF GRADE 5–9 STUDENTS IN SPECIALIZED SCHOOLS: DESIGN AND QUASI-EXPERIMENTAL EVALUATION

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Abstract. *The digital transformation of school assessment makes it possible to record not only the final answer of a learner but also the process by which the answer is reached. This article reports the design and evaluation of assessment-integrated adaptive software intended to develop the logical thinking of grade 5–9 students in specialized schools of Uzbekistan under the new national assessment system. The software combines a metadata-rich task bank, a multidimensional student model, a rule-based adaptive engine, tiered explanatory feedback, a reflective portfolio and a teacher analytics dashboard in a single diagnostic–formative cycle. A quasi-experimental study was carried out in 2023–2026 in Tashkent city, Jizzakh and Khorezm with 337 students (166 experimental, 171 control). At baseline the groups did not differ (mean level 2.67 vs 2.68; t = –0.05). After the intervention the experimental group reached a mean of 3.24 against 2.78 in the control group (Welch t = 5.11, p < 0.001; Cohen's d = 0.56; efficiency coefficient 1.16), and the share of students at the reproductive level fell from 47.0% to 17.5%. Fisher's angular transformation confirmed significant gains in task performance, strategy awareness, confidence and purposeful use of digital resources. The results suggest that digital tools develop logical thinking when they are embedded in criterion-based formative assessment rather than used as stand-alone testing instruments.*

Keywords: *logical thinking; formative assessment; adaptive learning; learning analytics; student model; specialized schools; lower secondary education; Uzbekistan.*

1. Introduction

Logical thinking – the ability to identify relevant information, compare and classify, establish cause–effect relations, build and test hypotheses and justify conclusions – is treated in international frameworks as a core outcome of lower secondary education. The PISA 2022 framework, for instance, defines mathematical literacy through formulating a situation mathematically, reasoning, interpreting results and defending conclusions [13]. UNESCO's 2023 Global Education Monitoring Report stresses that computer-based and adaptive assessment can shorten the feedback loop and reveal learning difficulties early, but also warns that technology does not improve learning by itself [17].

In Uzbekistan these issues have become practical with the expansion of the network of specialized schools (Presidential Decree PF-55 of 1 April 2024 [14]) and the introduction of a new assessment system that links diagnostic, formative, unit-summative and term-summative assessment. The system creates a formal space for formative work, yet in everyday practice electronic tools are still used mainly to score closed test items. The final score says little about *how*

a student reasons: which information was selected, which strategy was chosen, where the reasoning chain broke and whether the student was able to correct it.

The problem addressed in this study is therefore the gap between the developmental intent of the new assessment system and the largely summative use of digital tools. The **aim** of the article is to describe the architecture of assessment-integrated adaptive software for developing the logical thinking of grade 5–9 students and to evaluate its pedagogical effectiveness in a controlled experiment. Two research questions guided the work: (RQ1) Which functional components must a digital environment combine to turn assessment evidence into developmental feedback on logical thinking? (RQ2) Does learning with such an environment lead to statistically significant gains in logical thinking levels compared with conventional instruction and assessment?

2. Theoretical background

Research on formative assessment has shown that assessment improves learning when evidence about student performance is used to adapt teaching and when feedback tells the learner where they are, where they are going and what to do next [3; 8]. Feedback that addresses the task and the process is more effective than feedback directed at the person [8; 16]. For logical thinking this implies that feedback must target the reasoning step – an ignored condition, an irrelevant argument, an unchecked exception – rather than simply mark an answer as right or wrong.

Adaptive and intelligent tutoring research provides the technical side. Adaptive hypermedia personalises content, navigation and support on the basis of a user model [4]; knowledge tracing updates the probability that a skill has been mastered after each observed response [6]. Meta-analyses of intelligent tutoring systems report moderate positive effects, but with large variation depending on design and on how close to the solution step support is given [1; 10; 11]. Open learner models make the student model visible to learners and encourage reflection and goal setting [5]. Learning analytics, in turn, is useful only when indicators are grounded in a theory of learning [2; 7].

Finally, validity theory reminds us that a score is not valid in itself: validity is a property of the inferences drawn from evidence [12; 15]. A single correct answer may be a guess, and a wrong answer followed by self-correction may show growth. In the present study logical thinking is therefore operationalised through five components – information-analytical, operational-logical, problem-strategic, argumentative-communicative and reflective-corrective – and four developmental levels (reproductive, productive, independent and creative), each described by observable indicators.

3. Materials and methods

Design and participants. A quasi-experimental pre-test/post-test design with non-equivalent control groups was used. The experiment was carried out in 2023–2026 in specialized schools of Tashkent city (n = 113), Jizzakh region (n = 115) and Khorezm region (n = 109). In total 337 students of grades 5–9 took part: 166 in experimental groups (EG) and 171 in control groups (CG). Groups were matched on grade band, prior attainment, baseline performance on logical tasks and access to digital devices.

Intervention. In EG classes, lessons were organised around the assessment-integrated software developed in the study. Its architecture has four layers: (1) a pedagogical core that stores the five-component model of logical thinking, rubrics, an error taxonomy and grade 5–9 progression; (2) functional services – task constructor, diagnostic module, student model, adaptive engine, feedback module, analytics and reflective portfolio; (3) a data layer that stores task metadata, attempts, explanations and event logs; and (4) the technological infrastructure. Each task

carries a "pedagogical passport" specifying the target component and operation, subject and grade, complexity profile, answer format, evidence map, typical errors and descriptors.

The adaptive engine uses an interpretable rule-based score for selecting the next task: $S(t,u) = w_1(1 - |d_t - m_{uk}|) + w_2c_t + w_3e_t + w_4n_t - w_5r_t$, where d_t is task difficulty, m_{uk} is the current state of student *u* on component *k*, c_t is alignment with the learning goal, e_t is the expected evidential value, n_t is context novelty and r_t is the risk of overload or repetition. Recommendations are visible to the teacher, who may accept, modify or reject them and record the reason. Feedback is tiered: a metacognitive question, a directional hint, a conceptual prompt and, only as a last resort, a partial worked example; support is faded as independence grows [9]. A reflective portfolio stores the chain "first attempt – feedback – revised work – self-reflection", supporting self-regulated learning [18]. Task progression was differentiated by grade band: visual patterns and simple regularities in grades 5–6, classification, analogy, algorithms and cause–effect relations in grades 7–8, and hypotheses, evidence checking and alternative solutions in grade 9. CG classes followed the standard curriculum and conventional assessment.

Procedure. The experiment comprised three stages. At the *ascertaining stage* baseline diagnostics, a questionnaire on attitudes and motives, and an analysis of how students used electronic resources were carried out. It showed that the most frequent motive for doing electronic logic tasks was the wish to solve a problem independently (50.6% in EG and 46.8% in CG), whereas intrinsic cognitive interest was named by only 2.4% and 8.8% respectively; students also tended to value the score and the teacher's recommendation more than the reasoning itself. At the *formative stage* EG teachers integrated graded electronic exercises, interactive logic tasks, digital cases, an error map, an electronic portfolio and self- and peer-assessment into regular subject lessons (mathematics, informatics, natural sciences, history and native language). Before the stage, teachers took part in practical seminars on writing criteria and descriptors, asking productive questions, working with errors and interpreting digital evidence, and they moderated samples of student work to reach agreement on descriptors. At the *control stage* post-tests, questionnaires and portfolio analysis were conducted, and all results were cross-checked against electronic records, written solutions and teacher observation.

Interpretation of process data. A key principle was that no single digital trace is treated as evidence on its own. Completion time may reflect task difficulty, automated strategy or slow reading; a changed answer may indicate self-checking or mere hesitation; a help request may show awareness of one's difficulty rather than weakness; improvement on a retry may reflect genuine correction or simple memorisation of the item. Each trace was therefore triangulated with the quality of the answer, the student's written explanation and performance on a new, non-identical task, and no firm conclusion about a component was drawn until at least three different sources of evidence were available. The student profile was presented to learners in age-appropriate form – "which operation is stable?", "where do I need help?", "what is my next step?" – rather than as numerical ratings, and students could comment on it.

Instruments. Logical thinking was assessed with equivalent (non-identical) pre- and post-test task sets scored on a four-level scale: reproductive (2), productive (3), independent (4) and creative (5). Scoring took into account correctness, coherence of steps, adequacy of strategy, sufficiency of evidence and error detection. A questionnaire captured attitudes, responsibility, confidence, strategy awareness, use of e-resources, interest and participation. Log data (time, attempts, help requests, revisions) were triangulated with written solutions, teacher observation and portfolio materials.

Data analysis. Dichotomous indicators were compared with Fisher's angular transformation φ∗ (critical value 1.67 at α = 0.05). Level scores were compared with Welch's t-test; in addition, a χ^2 test of the level distributions and Cohen's d were calculated. The efficiency coefficient was computed as the ratio of EG to CG mean scores.

4. Results

Baseline equivalence. Before the intervention no indicator differed significantly between the groups (all φ∗ < 1.67; Table 1). Mean logical thinking levels were practically identical (EG 2.67 ± 0.75; CG 2.68 ± 0.72; t = –0.05, p = 0.96), and the level distributions did not differ ($\chi^2(3)$ = 0.28, p = 0.96).

Table 1. Positive responses on selected indicators before and after the experiment, %

Indicator	Before EG	Before CG	φ∗	After EG	After CG	φ∗
Performance on logical tasks	53.6	50.9	0.50	74.1	63.7	2.06
Understanding of solution strategy	50.0	50.3	0.05	80.7	69.6	2.38
Confidence in solving problems independently	72.3	64.3	1.58	81.3	70.8	2.28
Responsibility for completing e-tasks	67.5	64.3	0.62	96.4	83.6	4.14
Purposeful use of e-resources in subjects	69.3	64.9	0.86	94.0	80.7	3.80
Interest in electronic logic tasks	38.6	38.0	0.11	74.7	63.7	2.19
Active participation in logic tasks	23.5	24.0	0.11	72.9	62.0	2.14

Note: EG – experimental group (n = 166); CG – control group (n = 171); $\varphi*_{cr}$ = 1.67 (α = 0.05).

Post-test. After the intervention every indicator in Table 1 exceeded the critical value in favour of EG. The largest differences were observed for responsibility in completing electronic tasks (φ∗ = 4.14) and purposeful use of e-resources (φ∗ = 3.80). Understanding of the solution strategy rose in EG by 30.7 percentage points compared with 19.3 points in CG. Participation in online logic competitions also differed significantly (42.8% vs 24.0%; φ∗ = 3.69).

Figure 1 shows the change in the distribution of students by level. In EG the share of students at the reproductive level fell from 47.0% to 17.5%, while the shares at the independent (from 9.6% to 22.3%) and creative (from 2.4% to 9.6%) levels increased. In CG the distribution changed only slightly (reproductive level 45.6% → 40.4%). The post-test distributions differed significantly ($\chi^2(3)$ = 26.27, p < 0.001).

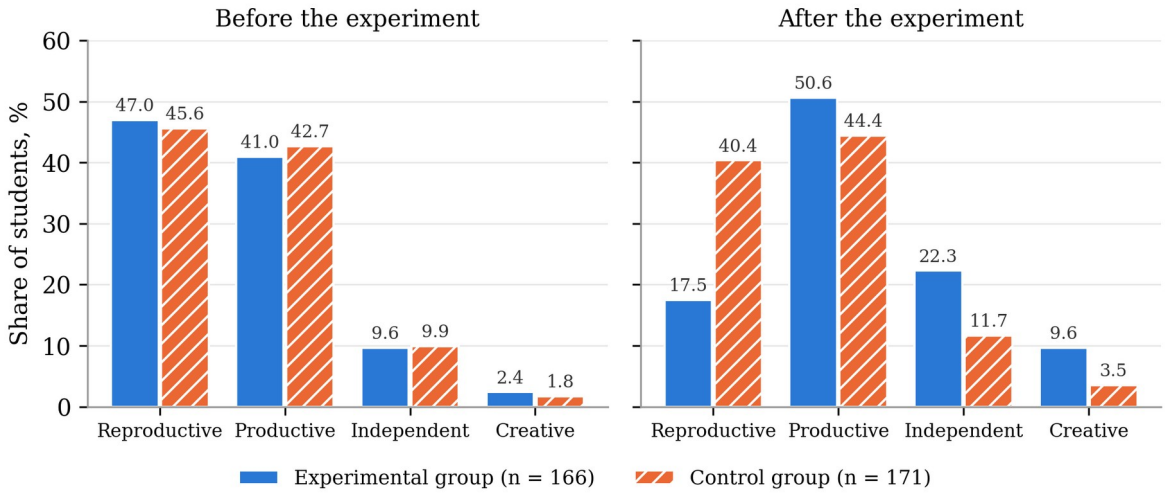


Figure 1. Distribution of students by level of logical thinking before and after the experiment, %

Table 2 summarises the mean scores by experimental site. The improvement in EG was consistent across regions: the efficiency coefficient ranged from 1.16 to 1.17 and the empirical t-value at each site exceeded the critical value. For the whole sample the EG post-test mean was 3.24 (SD = 0.85) against 2.78 (SD = 0.79) in CG (Welch $t = 5.11$, $p < 0.001$), corresponding to a medium effect size ($d = 0.56$).

Table 2. Mean level of logical thinking by experimental site

Site	EG before	CG before	EG after	CG after	Efficiency coefficient	t_{emp} after ($t_{cr} = 1.67$)
Tashkent city (n = 113)	2.63	2.63	3.19	2.73	1.17	2.93
Jizzakh region (n = 115)	2.74	2.74	3.30	2.84	1.16	3.01
Khorezm region (n = 109)	2.65	2.67	3.24	2.78	1.17	2.86
Total (N = 337)	2.67	2.68	3.24	2.78	1.16	5.11

Results by grade band. Gains were observed in all grade bands, but their character differed. Active participation in logic tasks at the end of the experiment reached 68.1% in grades 5–6, 73.3% in grades 7–8 and 83.3% in grade 9 of EG, compared with 57.1%, 61.3% and 67.7% in CG. Participation in online logic competitions was 42.6%, 39.0% and 46.7% in the respective EG grade bands versus 22.4%, 23.0% and 26.2% in CG ($\varphi* = 3.21–3.98$). Teacher observations indicated that short visual tasks with quick feedback were most effective in grades 5–6, branching algorithms and cause–effect chains in grades 7–8, and tasks requiring evidence checking and comparison of alternative solutions in grade 9. Small-group discussion, peer assessment and comparison of solutions within the platform noticeably strengthened students' oral and written argumentation.

5. Discussion

The results answer RQ2 positively: students who learned in the assessment-integrated environment moved from reproductive to independent and creative levels considerably more often

than their peers. The effect size (d = 0.56) is in the range reported in meta-analyses of intelligent tutoring systems [10; 11], which is plausible because the software shares their key mechanism – support given close to the reasoning step.

Regarding RQ1, the experiment suggests that the effect did not come from any single feature but from the closed cycle *diagnosis – adaptive task – process data – explanatory feedback – individual correction – monitoring*. Three design decisions appear to be critical. First, the task passport links every item to a component of logical thinking, so that log events acquire pedagogical meaning; a changed answer is interpreted together with time, explanation and the final argument rather than in isolation. Second, feedback was addressed to the strategy and not to the person, and the correct answer was shown only as a last resort, which kept students engaged in reasoning; this is consistent with the strong gains in strategy awareness. Third, the teacher remained the decision maker: the rule-based recommendation was transparent and could be overridden, which addresses the ethical requirement that algorithmic advice should not replace professional judgement [17].

The findings have practical implications for schools. Teachers need not only access to a platform but also assessment literacy: the ability to formulate criteria in terms of observable reasoning, to read an error map and to decide what the next task should be. We therefore recommend in-service modules on designing electronic logic tasks, formative assessment and developmental feedback, digital monitoring of learning outcomes, and criteria for assessing logical thinking. At school level, an interdisciplinary task bank with shared indicators allows the same reasoning strategy to be practised in different subjects, which supports transfer. Finally, data governance – role-based access, minimal data collection and explainable recommendations – is a precondition for students and parents to trust the system rather than an optional technical feature.

The study has limitations. Groups were matched rather than randomly assigned; outcome measures were developed by the researcher; and the weights of the selection rule were calibrated empirically and require further psychometric validation. Delayed transfer and long-term retention were examined only partially. Future work should include randomised designs, item response modelling of the task bank and a closer analysis of which feedback tiers produce the greatest gains for different student profiles.

6. Conclusion

Assessment-integrated adaptive software can turn the new assessment system of Uzbekistan from a mechanism of control into a mechanism for developing logical thinking. Its effectiveness depends on a pedagogical core (a component model of logical thinking, rubrics and an error taxonomy), metadata-rich tasks, a transparent adaptive engine, tiered process-oriented feedback and teacher analytics working as one cycle. In the experiment with 337 students of grades 5–9 this approach produced statistically significant gains (efficiency coefficient 1.16; d = 0.56) across all three regions. The software and the accompanying methodology can be recommended for specialized schools and for in-service teacher training in digital formative assessment.

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IMPROVING THE METHODOLOGY FOR DEVELOPING INDEPENDENT WORK SKILLS IN FUTURE PRIMARY SCHOOL TEACHERS: EXPERIMENTAL VERIFICATION OF EFFECTIVENESS

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Abstract. *This article presents a model for improving the methodology of developing independent work skills in pre-service primary school teachers and examines the effectiveness of that model. The study aimed to develop a model comprising motivational, cognitive, activity-based, and reflective components and to substantiate it through a pedagogical experiment. Between 2023 and 2026, 253 undergraduate students majoring in Primary Education at three higher education institutions in Uzbekistan (experimental group, n=131; control group, n=122) and 12 instructors participated in the study. At the baseline stage, mean scores on the four criteria ranged from 3.19 to 3.89 on a five-point scale, and the cognitive component was found to be at a low level. After the formative intervention, the mean scores of the experimental group rose to 4.64–4.88, corresponding to a high level, whereas those of the control group remained within the range of 3.52–3.89. The between-group difference was statistically significant (Mann–Whitney test, $p<0.001$). The findings indicate that the proposed model can be introduced into contemporary teacher education practice.*

Keywords: *independent work skills; pre-service primary school teacher; methodology improvement; pedagogical model; professional readiness; pedagogical experiment.*

Introduction. At the current stage of higher education development, preparing specialists who think independently, acquire knowledge autonomously, and engage in systematic self-improvement is regarded as a priority task [1]. Within the national concepts for the development of the higher education system and of science until 2030, enhancing the quality of training of competitive teaching staff has been designated as a pressing objective [2, 3]. In this process, the formation of pre-service teachers' independent work skills occupies a particular place.

The specificity of a primary school teacher's work lies in its multidisciplinary and multifunctional nature: the teacher translates information from diverse fields of knowledge into a form comprehensible to children, performs educational and developmental functions alongside instruction, cooperates with families, and takes pupils' age-related characteristics into account [4]. Consequently, independent work skills are required of a primary school teacher in two respects: in autonomously managing one's own professional growth and in organizing the formation of independent learning actions in younger pupils.

The scientific literature interprets independent work skills in various ways. In psychology, they are conceptualized as an internal orientation (set) toward a particular action [5], as a process associated with the activity of thinking [6], and as a psychological basis for attaining professional competence [7]. Pedagogical studies regard independent activity as the initial stage in the

improvement of competence [8] and have addressed the organization of pre-service teachers' independent learning [9, 10], the development of pre-service primary school teachers' independent work competencies [11], and the methodology of organizing students' independent work [12]. Independent work is defined as an activity carried out without the teacher's direct supervision but under the teacher's guiding influence [13]. International studies have examined pre-service primary school teachers preparedness to teach school subjects [14], students autonomous learning engagement in higher education [15], and the content of pre-service primary school teachers' independent learning activity [16].

Nevertheless, existing interpretations insufficiently take into account the multidisciplinary character of primary school teachers' work and the characteristics of younger pupils. Although teaching and methodological resources outline the general potential of independent activity, they provide insufficient specific methodological support for preparing students to organize it. This was also confirmed by the survey conducted within the present study: among the respondents (253 students and 12 instructors), 88% rated their preparation in higher education as insufficient, 96% considered a specialized course on organizing independent activity necessary, and respondents who regarded themselves as fully prepared accounted for half of the sample. Thus, there is a contradiction between the objective need to organize independent activity and the specialized preparation of pre-service teachers for it.

The aim of the study is to develop a model for improving the methodology of developing independent work skills in pre-service primary school teachers and to substantiate its effectiveness through a pedagogical experiment. **The research hypothesis** is that instruction organized on the basis of a model grounded in the interrelation of motivational, cognitive, activity-based, and reflective components significantly improves students' levels of independent work skills relative to the control group.

To achieve this aim, the following objectives were set:

1. to clarify the pedagogical potential of improving the methodology of developing independent work skills in pre-service primary school teachers;

2. to refine the model for developing independent work skills in pre-service primary school teachers;

3. to improve the methodology of developing independent work skills in pre-service primary school teachers;

4. to determine the effectiveness of this methodology.

Methods. Research design and participants. The study was conducted as a pedagogical experiment involving experimental and control groups in 2023–2026, within the framework of the qualification requirements for the 60110400 Primary Education programme [17]. The experiment comprised three stages: ascertaining (2023–2024), formative (2024–2025), and control (2025–2026). At the ascertaining stage, assessment criteria were developed and the existing level of preparedness was determined; at the formative stage, the model was tested in the experimental group; at the control stage, changes in the two groups were compared. Students in the control group did not receive specialized instruction in this subject.

In total, 253 students of the Primary Education programme and 12 instructors participated in the experiment. The students came from Tashkent International University of Financial Management and Technology (n = 83), Kokand State Pedagogical University (n = 89), and Gulistan State Pedagogical Institute (n = 81). They were allocated to an experimental group (EG)

and a control group (CG). The initial characteristics of the two groups were similar, which provided a sound basis for comparing the results (Table 1).

Table 1. Characteristics of the experimental and control groups

Indicator	Experimental group (EG)	Control group (CG)
Number of students	131	122
Age, years	20–23	20–23
Sex	female	female
Academic achievement rate	96%	97%

Criteria and assessment instruments. Independent work skills were examined across four components: motivational, cognitive, activity-based, and reflective. Criteria and indicators corresponding to each component were developed (Table 2).

The diagnostic instruments comprised a purpose-designed questionnaire incorporating elements of a social survey; a 21-item test measuring readiness to organize independent activity in the process of teaching pedagogy; an online questionnaire; and statistical methods of data processing. Students self-assessed each indicator on a five-point scale, and the mean score for each criterion was interpreted as follows: 0–3.4, low; 3.5–4.4, medium; and 4.5–5.0, high level.

Table 2. Assessment criteria and indicators

Component	Criterion	Indicators
Motivational	Motivational	awareness of the importance of independent activity; interest in using the creative method; perceived need to organize independent activity; positive attitude toward pupils' initiative
Cognitive	Gnostic	knowledge of the creative method; knowledge of the principles of organizing independent work; knowledge of the algorithm of independent activity; knowledge of the methodology of conducting scientific experiments
Activity-based	Technological	orientation in information resources; differentiation of learning activity according to individual characteristics; selection of forms of work; development of lesson plans; organization of research
Reflective	Reflective	interpretation of results; assessment of quality; analysis and evaluation of the results of one's own professional activity; analysis of one's own behavior and that of others

Formative intervention: the model and the training course. Educational technology implies the advance design of the educational process and the systematic application of content, methods, tools, and organizational forms that ensure the attainment of a specified goal [18]; it is also interpreted as a set of interactive methods and tools aimed at developing students' creative potential [19]. Drawing on this approach, a model for improving the methodology was developed. The model consists of goal-oriented, methodological, content, methodological-technological, criterion-evaluative, and outcome blocks. It is grounded in competence-based and activity-based approaches and in the principles of scientific rigor, systematicity, activity, the unity of theory and practice,

consideration of individual characteristics, conscious learning, and professional orientation. Five pedagogical conditions were identified for implementing the model: the unity of theoretical and practical components; the use of various academic subjects; a student-centered approach; positive cooperation among the participants of the educational process; and the active use of information and communication technologies.

The model was implemented through the training course "Organizing Independent Activity in Pre-Service Primary School Teachers." The course totaled 240 hours (8 credits), of which 120 were contact hours and 120 were independent study hours. Its theoretical part had three components: subject preparation (mathematical and natural-science disciplines), general professional preparation (pedagogy of primary education), and a special course. The practical part included sessions in the innovative educational technologies laboratory, pedagogical practice (seven assignments), term papers, and final qualification theses (ten topics). The instruction employed the creative method together with problem-based presentation, partial-search, and research methods. The creative method is a means of achieving a didactic goal through the detailed elaboration of a problem and culminates in a concrete practical outcome [20]. Lectures, seminars, practical and laboratory sessions, and forms of independent work were used; lectures were built on the structure of the problem lecture, namely, creating a problem situation, analyzing the problem, and advancing a hypothesis [21]. The methods were selected in accordance with the components (Table 3). The textbook "Innovation and Integration in Primary Education" [22] served as the teaching and methodological resource.

Table 3. Teaching methods applied by component

Component	Methods applied
Motivational	problem-based presentation, partial-search, research method
Cognitive	explanatory-illustrative, reproductive, problem-based presentation
Activity-based	creative method, partial-search, research, reproductive
Reflective	creative method, partial-search, research, problem-based presentation

Statistical stage. At the final stage, 23 students from the experimental group and 24 from the control group were selected. Each student was assessed on 20 items using a five-point scale, so that the total score ranged from 20 to 100. Because the groups were independent samples and the measurement scale was at least ordinal, the non-parametric Mann–Whitney (Wilcoxon rank-sum) test was applied. The test values were verified by recalculation from the raw final scores.

Results.

3.1. Results of the ascertaining stage. At the ascertaining stage, students' attitudes toward the profession and the initial state of their independent work skills were examined. In the experimental group, 84% of respondents stated that they liked their chosen profession, 15% found it difficult to answer, and 1% stated that they did not like it. With regard to the motivational component, 80% of students considered independent work skills necessary for their future professional activity. However, only 37% of respondents positively assessed their interest in independent activity, 48% expressed doubt, and just 9% indicated that they definitely enjoyed devising independent creative tasks.

Concerning the cognitive component, the correct definition of the concept "creative method" was selected by 25% of respondents, that of "students' independent activity" by 40%, and that of "skill" by 79%; 45% of students regarded independent activity as a productive teaching

method. With regard to the reflective component, 72% of respondents rated their own skills as medium, 24% as low, and 4% as high; 83% of students expressed the opinion that a competent teacher should be familiar with the technologies of independent activity, and no negative responses were recorded.

The mean scores by criterion are presented in Table 4. In both groups, the cognitive component was at a low level and the other three components were at a medium level; none of the components reached a high level. The initial between-group difference did not exceed 0.19 points on any criterion.

Table 4. Mean scores of the components of independent work skills at the ascertaining stage (five-point scale)

Criterion	EG, score	EG, level	CG, score	CG, level
Motivational	3.89	medium	3.83	medium
Cognitive (gnostic)	3.19	low	3.38	low
Activity-based (technological)	3.59	medium	3.52	medium
Reflective	3.75	medium	3.75	medium

3.2. Results of the control stage. Following the formative intervention, the mean proportion of correct answers on the control test in the experimental group was 92.5%: all students answered seven questions correctly, and on a further six questions the proportion of correct answers exceeded 90%. The lowest result (72%) was recorded for the question concerning the stage of teaching primary school mathematics at which it is appropriate to apply the creative method.

In the experimental group, the mean scores on all four criteria corresponded to a high level (4.64–4.88), whereas in the control group all criteria remained at a medium level (Table 5). The largest gains were observed in the cognitive (+1.45) and activity-based (+1.15) components. In the control group, changes ranged from 0.00 to 0.30 points; the increase in the cognitive component from 3.38 to 3.68 moved it from the low level to the lower part of the medium level.

Table 5. Mean scores at the control stage and change relative to the ascertaining stage

Criterion	EG, score	EG, level	EG, change	CG, score	CG, level	CG, change
Motivational	4.88	high	+0.99	3.89	medium	+0.06
Cognitive (gnostic)	4.64	high	+1.45	3.68	medium	+0.30
Activity-based (technological)	4.74	high	+1.15	3.52	medium	0.00
Reflective	4.72	high	+0.97	3.83	medium	+0.08

At the level of individual indicators, all values in the experimental group were at least 4.13 points. The highest scores were recorded for a positive attitude toward pupils' initiative (4.98), knowledge of the algorithm of independent activity (4.96), and orientation in information resources (4.90), and the lowest for knowledge of the methodology of conducting scientific experiments (4.13) and the ability to develop lesson plans (4.54).

Discussion. The principal finding of the study is that, among students who underwent model-based instruction, the indicators for all four components of independent work skills rose from medium or low levels to a high level, whereas the changes in the control group were small.

The statistical significance of the between-group difference ($p < 0.001$) and the large effect size ($r = 0.85$) support the hypothesis advanced.

The largest gains were observed in the cognitive component (+1.45), which had initially received the lowest ratings, and in the activity-based component (+1.15). This result can be explained by the situation at the ascertaining stage: although 80% of students considered independent work skills necessary, only 25% selected the correct definition of the concept "creative method," which indicates a gap between perceived need and knowledge. The use of problem situations, partial-search and research methods, as well as laboratory and practical sessions, in the course appears to have narrowed this gap. This approach is consistent with views that ground learning in personal experience and problem situations [23]. The gain in the activity-based component corresponds to the interpretation that links competence to the ability to apply knowledge in practice [24]: students were given the opportunity to practice working with information, developing lesson plans, and organizing research. The requirement of unity between theoretical and practical preparation [25] was reflected in the structure of the course (the theoretical part, laboratory and practical sessions, term papers, and final theses).

The gain in the motivational component was comparatively smaller (+0.99), because this component had the highest baseline score (3.89) of the four. From the standpoint that views readiness as an internal "set" toward activity [26], this is to be expected: a positive attitude is consolidated as knowledge and practical experience are acquired. The gain in the reflective component (+0.97) may be associated with students' participation in the final stage, which involved analyzing and evaluating the results of their own professional activity; the approach that treats reflection as a process of evaluating one's own thinking and activity and reorganizing it [27] supports this interpretation. The pedagogical essence of the problem was analyzed in the author's earlier work [28]; the present study, in turn, tested the effectiveness of the model experimentally.

In terms of practical significance, the developed model and the course content have been incorporated into the content of the subjects "Innovation and Integration in Primary Education," "Pedagogy of Primary Education," and "General Psychology." International studies have focused on pre-service primary school teachers' preparedness to teach mathematics [14] and on students' autonomous learning engagement in higher education [15]; the results presented here complement this line of research with empirical data on a specific model for training primary school teachers and on its effectiveness.

Conclusion. The results of the study show that the model for improving the methodology of developing independent work skills in pre-service primary school teachers significantly raised students' level of preparedness relative to the control group. The main conclusions are as follows:

1. Independent work skill was conceptualized as a stable personal quality that expresses the ability to solve professional and pedagogical tasks in the context of multidisciplinary pedagogical activity. It comprises motivational, cognitive, activity-based, and reflective components, to which the motivational, gnostic, technological, and reflective criteria and the low, medium, and high levels were assigned correspondingly.
2. At the ascertaining stage, the cognitive component was at a low level in both groups (3.19 and 3.38), while the remaining components were at a medium level; none of the components reached a high level.
3. The model, comprising goal-oriented, methodological, content, methodological-technological, criterion-evaluative, and outcome blocks, together with the course "Organizing Independent Activity in Pre-Service Primary School Teachers," was tested in

the experimental group. As a result, the mean scores of the experimental group rose to 4.64–4.88 on all criteria (high level), whereas those of the control group remained within the range of 3.52–3.89.

4. The between-group difference in final scores was statistically significant: the mean score was 83.3 in the experimental group and 60.8 in the control group (Mann–Whitney test, $p<0.001$; $r=0.85$).

Practical recommendations. (1) To incorporate the model into the content of the pedagogical and psychological subjects in the Primary Education curriculum; (2) to increase, within the course, the share of practical assignments devoted to the methodology of conducting scientific experiments and to the development of lesson plans; (3) to use the system of criteria and indicators for diagnosing students' independent work skills.

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DEVELOPING PRESERVICE TEACHERS' RESEARCH SKILLS THROUGH GENERATIVE ARTIFICIAL INTELLIGENCE A PEDAGOGICAL INTERVENTION STUDY

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Abstract. *This article examines the pedagogical mechanisms for developing preservice teachers' research skills through the integration of artificial intelligence (AI) into higher teacher education. It explores the educational potential of generative AI in supporting scientific inquiry, including research problem formulation, scholarly information retrieval, critical source evaluation, research design, data analysis, and reflective practice. Drawing on theoretical analysis and pedagogical modeling, the article identifies four interconnected mechanisms: motivational-stimulating, cognitive-informational, activity-practical, and reflective-corrective. Particular attention is given to the principle of human-centered AI integration, according to which artificial intelligence supports research activities while students retain responsibility for verifying information, critically evaluating evidence, justifying methodological choices, and making independent research decisions. The article also proposes a multidimensional diagnostic framework comprising motivational-value, cognitive, activity-operational, and reflective-evaluative criteria for assessing research skill development. The proposed framework provides a theoretical and methodological basis for designing AI-supported research-oriented learning environments in teacher education.*

Keywords: *artificial intelligence, preservice teachers, research skills, pedagogical mechanisms, generative AI, teacher education, research-based learning, critical thinking, reflective practice, academic integrity.*

Introduction.

The rapid advancement of artificial intelligence (AI) technologies is transforming higher education by creating new opportunities for knowledge acquisition, scientific inquiry, and the development of professional competencies. In teacher education, these transformations have increased the importance of preparing future teachers who are capable not only of applying innovative educational technologies but also of independently identifying pedagogical problems, critically evaluating scientific information, conducting systematic investigations, and making evidence-based professional decisions. Consequently, developing preservice teachers' research skills has become an important priority in contemporary higher pedagogical education.

Research skills constitute an essential component of teachers' professional competence. They enable future educators to investigate educational challenges, formulate research questions, select appropriate methodological approaches, analyze empirical information, and evaluate the effectiveness of pedagogical practices. Furthermore, research-oriented competence contributes to the development of critical thinking, intellectual independence, reflective practice, and the ability to continuously improve professional activities. In this context, teacher education institutions are

increasingly expected to establish learning environments that integrate theoretical knowledge with practical research experiences.

The emergence of generative artificial intelligence has significantly expanded the possibilities for organizing research-oriented learning. AI-powered tools can assist students in identifying research problems, searching for scholarly literature, organizing and critically analyzing information, developing research designs, processing data, improving academic writing, and presenting research findings. Nevertheless, the availability of these technological resources does not automatically ensure the development of research skills. AI-generated information may contain factual inaccuracies, unsupported interpretations, or unreliable bibliographic references. Moreover, excessive dependence on automated assistance may limit students' opportunities to develop independent reasoning and methodological decision-making abilities.

Therefore, the educational value of artificial intelligence should be considered not merely in terms of technological accessibility or efficiency but primarily through the pedagogical mechanisms that regulate its integration into research activities. Such mechanisms should ensure that AI functions as an intellectual support tool rather than a substitute for students' cognitive engagement. A fundamental principle of this approach is that artificial intelligence provides assistance, while students verify information, critically evaluate evidence, substantiate their conclusions, and independently make final research decisions.

The theoretical foundations of this perspective are associated with research-based learning, competency-oriented education, constructivist approaches, and reflective professional development. These approaches emphasize active student participation in knowledge construction, the integration of theoretical understanding with practical inquiry, and the progressive development of learner autonomy. In AI-supported research environments, these principles acquire additional significance because students must learn not only to use technological tools but also to assess the reliability, relevance, and ethical implications of AI-generated information.

Recent international research has highlighted both the educational potential and the limitations of generative AI. Miao and Holmes (2023) emphasize the importance of human-centered approaches to AI integration in education and research. Kasneci et al. (2023) identify opportunities for supporting learning and academic activities while drawing attention to challenges related to accuracy, critical evaluation, and responsible technology use. These perspectives suggest that the effectiveness of AI-supported education depends substantially on instructional design, academic integrity, and the preservation of human intellectual responsibility.

In Uzbekistan, the modernization of higher education and the expansion of digital technologies have created favorable conditions for integrating innovative approaches into teacher preparation. However, the pedagogical integration of artificial intelligence into preservice teachers' research activities requires a systematic methodological foundation. In particular, further theoretical clarification is needed regarding the mechanisms through which AI-supported learning can strengthen research motivation, methodological knowledge, practical inquiry skills, and reflective evaluation.

Although existing studies have examined artificial intelligence literacy, technology acceptance, academic writing, and AI-assisted learning, the pedagogical mechanisms for developing preservice teachers' research skills as an integrated system require further conceptual examination. Particular attention should be given to the relationship between AI-supported research activities and students' independent scientific reasoning, critical evaluation, methodological competence, and reflective practice.

The aim of this article is to theoretically substantiate the pedagogical mechanisms for developing preservice teachers' research skills through artificial intelligence and to propose a methodological framework for integrating AI-supported research activities into higher teacher education.

To achieve this aim, the article addresses three interconnected objectives: identifying the educational opportunities and pedagogical limitations of generative AI in research-oriented learning; examining the motivational, cognitive, practical, and reflective mechanisms underlying research skill development; and proposing diagnostic criteria and developmental levels for evaluating preservice teachers' research skills.

The article adopts a theoretical and methodological perspective based on literature analysis, comparative examination, conceptual synthesis, and pedagogical modeling. Rather than reporting experimental findings, it develops a conceptual foundation for designing AI-supported research learning environments that promote independent inquiry, critical thinking, academic integrity, and professional development.

LITERATURE REVIEW.

The development of research skills among preservice teachers has been widely examined within the theoretical frameworks of competency-based education, activity-oriented learning, reflective practice, and professional teacher preparation. These approaches emphasize that research competence extends beyond the acquisition of methodological knowledge and involves the ability to independently identify educational problems, critically evaluate information, select appropriate research methods, and make evidence-based pedagogical decisions.

Uzbek scholars have made significant contributions to the theoretical and methodological foundations of innovative teacher education. In particular, Ishmuhamedov, Abduqodirov, and Pardayev (2008) examined the application of innovative educational technologies, emphasizing interactive learning, student engagement, and the organization of independent educational activities. Their methodological perspectives provide a foundation for designing research-oriented learning environments in which students actively participate in problem-solving, information analysis, and knowledge construction.

Begimqulov (2011) explored the theoretical and practical foundations of informatization in pedagogical education, highlighting the importance of integrating information technologies into educational processes. These contributions are particularly relevant to the present discussion because AI-supported research learning requires not only access to digital technologies but also appropriate instructional organization, methodological guidance, and the development of students' information-related competencies.

Russian pedagogical scholarship provides additional theoretical perspectives on the development of professional and research-related competencies. Slastenin, Isayev, and Shiyanov (2013) conceptualized teacher preparation as an integrated pedagogical process involving professional knowledge, practical activity, and personal development. Their approach supports the understanding of research skills as an interconnected system rather than a collection of isolated methodological procedures.

Similarly, Zimnyaya (2003) examined key competencies as a paradigm of educational outcomes, emphasizing the importance of integrating knowledge, practical abilities, personal characteristics, and experience. From this perspective, research skills can be understood as multidimensional competencies that combine students' motivation for scientific inquiry, methodological knowledge, practical research performance, and reflective evaluation.

The conceptual foundations of research-oriented education are also closely associated with Dewey's (1910) theory of reflective thinking and Schön's (1983) concept of the reflective practitioner. Dewey emphasized inquiry as a process involving the recognition of problematic situations, examination of evidence, and development of reasoned conclusions. Schön highlighted the importance of reflection in professional practice, demonstrating how practitioners develop professional judgment through the critical examination of their experiences.

Taken together, these theoretical perspectives suggest that preservice teachers' research skills should be developed through pedagogically structured activities that integrate motivation, knowledge acquisition, practical inquiry, independent decision-making, and reflection. This integrated understanding provides the conceptual basis for examining how artificial intelligence can support research-oriented learning without replacing students' intellectual responsibilities.

The rapid development of generative artificial intelligence has introduced new possibilities for supporting university students' learning and research activities. AI-based systems can assist learners in generating preliminary ideas, formulating research questions, organizing scholarly information, examining alternative methodological approaches, analyzing data, and improving academic communication. Nevertheless, their educational value depends on how these technological capabilities are integrated into pedagogical practice.

Miao and Holmes (2023), in UNESCO's guidance on generative AI in education and research, advocate a human-centered approach that prioritizes human agency, ethical responsibility, and educational objectives. Their perspective suggests that AI should enhance human capabilities rather than replace intellectual engagement or independent judgment.

Kasneci et al. (2023) similarly identify the potential of large language models to support educational activities while emphasizing risks associated with inaccurate information, algorithmic limitations, and uncritical dependence on automated responses. These considerations are especially relevant to research-oriented learning, where the credibility of scientific evidence and the justification of methodological decisions are fundamental requirements.

Baig and Yadegaridehkordi (2024), in their systematic review of ChatGPT in higher education, examined the opportunities and challenges associated with generative AI adoption. Their analysis demonstrates the expanding role of AI in academic environments and highlights the need for further research into pedagogically meaningful applications of these technologies.

Campbell and Cox (2024) explored the integration of generative AI into the research writing process, emphasizing the importance of instructional guidance and critical evaluation. Their work is particularly relevant because research writing requires students to distinguish between preliminary AI-generated suggestions and academically substantiated arguments.

Chen and Cheung (2025), through a systematic review and meta-analysis, investigated the effects of generative AI on university students' learning outcomes. Their findings indicate that generative AI can contribute positively to academic achievement, motivational outcomes, and higher-order thinking under certain educational conditions. However, the absence of a statistically significant overall effect on metacognition suggests that reflective thinking and self-regulation may require explicit pedagogical support rather than emerging automatically through AI use.

These studies demonstrate that generative AI should not be conceptualized merely as a technological instrument for accelerating academic tasks. Its pedagogical significance lies in the opportunities it creates for inquiry-based learning, critical evaluation, methodological reasoning, and progressively independent research activity.

Recent studies conducted in Uzbekistan demonstrate increasing scholarly interest in the integration of artificial intelligence into teacher education and the development of students' digital competencies.

Haytboyeva, Shihova, and Saidmamatov (2026) examined the integration of AI literacy into the formation of information culture among preservice teachers. Their research emphasizes the importance of critical evaluation of AI-generated content, ethical technology use, reflective learning, and pedagogically structured AI integration. These aspects are closely related to research-oriented learning because students must be capable of distinguishing reliable scientific evidence from inaccurate or unsupported AI-generated information.

Zaripova et al. (2026) investigated the relationship between generative AI use, self-regulation, and pedagogical competence among higher education students in Uzbekistan. Their findings draw attention to the importance of academic autonomy, motivation, and responsible engagement with AI technologies. These factors are particularly relevant to the development of research skills, which require independent planning, critical judgment, and the ability to regulate one's own investigative activities.

Köse and Kudratovna (2026) examined factors influencing ChatGPT acceptance among preservice English language teaching students in Uzbekistan. Their work contributes to understanding future teachers' perceptions of generative AI and the conditions influencing its adoption in educational settings.

Although these studies provide valuable insights into AI literacy, information culture, self-regulation, pedagogical competence, and technology acceptance, they do not fully address the specific pedagogical mechanisms through which artificial intelligence can be systematically integrated into the development of preservice teachers' research skills.

In particular, further theoretical clarification is needed regarding how AI-supported inquiry can simultaneously promote research motivation, methodological knowledge, practical research performance, critical source evaluation, reflective judgment, and independent scientific decision-making.

The reviewed literature reveals three interconnected issues requiring further theoretical consideration.

First, existing pedagogical theories provide substantial foundations for research-oriented teacher education, but their application to AI-supported scientific inquiry requires methodological adaptation. Traditional approaches to independent learning and reflective practice must be reconsidered in educational environments where students can obtain automatically generated explanations, methodological suggestions, and research-related content.

Second, contemporary research on generative AI frequently focuses on technological adoption, academic writing, general learning outcomes, or AI literacy. Comparatively less attention has been devoted to conceptualizing the pedagogical mechanisms that connect AI-assisted research activities with the integrated development of preservice teachers' research skills.

Third, the availability of generative AI creates a fundamental pedagogical challenge: technological assistance may facilitate the completion of research assignments without necessarily strengthening students' independent inquiry abilities. Therefore, effective AI integration requires instructional mechanisms that explicitly promote verification, critical evaluation, methodological justification, academic integrity, and reflective practice.

Addressing these issues, the present article conceptualizes preservice teachers' research skills through four interconnected dimensions: motivational-value, cognitive, activity-operational,

and reflective-evaluative. Their development is considered within a pedagogical framework in which artificial intelligence supports research activities while students retain responsibility for evaluating evidence, selecting research methods, interpreting information, and making final scientific decisions.

Accordingly, the central proposition of this article is that the educational potential of artificial intelligence for research skill development depends not primarily on the availability of AI technologies but on the pedagogical mechanisms through which these technologies are integrated into meaningful, independent, and critically evaluated research activities.

RESEARCH METHODOLOGY.

This article employs a theoretical and methodological research design to examine the pedagogical mechanisms for developing preservice teachers' research skills through artificial intelligence. The study is based on the assumption that the educational potential of generative AI depends on its purposeful integration into research-oriented learning activities rather than on technological accessibility alone.

The methodological framework combines competency-based, activity-oriented, constructivist, and reflective approaches. The competency-based approach considers research skills as an integrated combination of knowledge, practical abilities, motivation, and independent judgment. The activity-oriented approach emphasizes students' active participation in scientific inquiry, while the constructivist approach highlights the development of knowledge through problem-solving and critical engagement with information. The reflective approach focuses on students' ability to evaluate research decisions, identify limitations, and improve their investigative practices.

The methodological analysis involves four complementary methods: theoretical analysis of pedagogical and AI-related literature, comparative examination of educational approaches, conceptual synthesis of research skill components, and pedagogical modeling. These methods provide a foundation for identifying the mechanisms through which AI can support research skill development in higher teacher education.

Unlike an experimental investigation, the present article does not evaluate the effectiveness of a specific intervention through quantitative comparisons. Instead, it develops a conceptual framework intended to guide the organization, implementation, and subsequent evaluation of AI-supported research-oriented learning.

Within the proposed framework, preservice teachers' research skills are understood as an integrated system of motivational, cognitive, practical, and reflective capabilities that enable students to conduct systematic educational inquiry.

The motivational-value component encompasses students' interest in scientific investigation, recognition of the professional significance of research, willingness to explore pedagogical problems, and readiness for independent inquiry.

The cognitive component includes knowledge of research methodology, scientific information sources, research procedures, methods of data analysis, and the opportunities and limitations of artificial intelligence in academic research.

The activity-operational component refers to the practical ability to identify research problems, formulate research questions, plan investigations, select appropriate methods, evaluate scholarly sources, analyze information, and develop evidence-based conclusions.

The reflective-evaluative component involves the critical examination of research procedures and outcomes, recognition of methodological limitations, self-assessment, verification of AI-generated information, and continuous improvement of research activities.

These components are considered interdependent. Motivation encourages participation in research activities, methodological knowledge supports informed decisions, practical engagement enables the application of research procedures, and reflection facilitates the evaluation and improvement of research performance.

The proposed methodological framework is guided by five interconnected pedagogical principles.

Human-centered AI integration. Artificial intelligence is positioned as a supportive educational resource rather than an autonomous source of scientific authority. Students retain responsibility for evaluating evidence, selecting research methods, interpreting information, and making final research decisions.

Research-oriented learning. AI-supported activities are organized around authentic pedagogical problems that require students to formulate questions, investigate information, compare alternatives, and substantiate conclusions.

Critical verification and academic integrity. AI-generated information must be examined against credible scholarly sources. Students are expected to verify bibliographic references, identify unsupported claims, acknowledge the use of AI where required, and maintain responsibility for the originality and accuracy of their academic work.

Progressive learner independence. Methodological guidance and AI-supported scaffolding should gradually decrease as students demonstrate greater competence in independent research planning, information evaluation, and methodological decision-making.

Reflective evaluation. Students should systematically examine their research activities, assess the appropriateness of AI assistance, identify errors, and determine how their investigative approaches can be improved.

Together, these principles establish the methodological conditions for integrating artificial intelligence into research-oriented teacher education without reducing students' intellectual engagement.

The proposed framework organizes AI-supported research learning through five interconnected stages: diagnostic orientation, motivational engagement, AI-supported research practice, independent inquiry, and reflective evaluation.

At the diagnostic orientation stage, students' initial research knowledge, methodological understanding, and readiness for independent inquiry are examined to identify individual learning needs.

The motivational engagement stage involves introducing relevant pedagogical problems, demonstrating the professional significance of research, and encouraging students to formulate questions requiring systematic investigation.

During the AI-supported research practice stage, students engage in research-related activities with methodological guidance and appropriate AI assistance. These activities include formulating research problems, searching for scholarly information, evaluating sources, designing investigations, analyzing information, and preparing academic materials.

The independent inquiry stage emphasizes students' increasing responsibility for selecting research methods, verifying information, interpreting evidence, and justifying conclusions. AI

remains available as a supporting resource, but students are expected to demonstrate independent methodological reasoning.

Finally, the reflective evaluation stage focuses on reviewing research processes, identifying errors, assessing the credibility of evidence, evaluating the contribution and limitations of AI assistance, and planning further improvement.

The framework is organized around a central pedagogical principle: AI supports the research process, while the student verifies information, critically evaluates evidence, substantiates conclusions, and makes the final research decision.

CONCLUSION.

The integration of artificial intelligence into higher teacher education creates new opportunities for developing preservice teachers' research skills and strengthening their readiness for independent scientific inquiry. However, the educational potential of AI cannot be realized through technological implementation alone. Its meaningful contribution to research skill development requires a systematic pedagogical approach that combines methodological guidance, active student participation, critical evaluation, academic integrity, and reflective practice.

The theoretical analysis presented in this article identifies four interconnected pedagogical mechanisms for developing preservice teachers' research skills through artificial intelligence: motivational-stimulating, cognitive-informational, activity-practical, and reflective-corrective. These mechanisms provide a conceptual foundation for encouraging students' engagement in scientific inquiry, strengthening their methodological knowledge, supporting practical research activities, and developing their ability to critically evaluate research processes and outcomes.

The proposed framework conceptualizes research skills through motivational-value, cognitive, activity-operational, and reflective-evaluative components. Their integration reflects the multidimensional nature of research competence and emphasizes the importance of developing not only technological proficiency but also independent scientific reasoning, methodological awareness, and reflective judgment. The suggested diagnostic criteria and developmental levels offer a structured basis for assessing students' progression from guided inquiry toward creative and independent research activity.

A central conclusion of this study is that artificial intelligence should function as an intellectual and methodological support tool rather than a substitute for students' research activities. AI-generated information, methodological suggestions, and analytical outputs require verification, critical interpretation, and appropriate scholarly justification. Accordingly, students must retain responsibility for formulating research questions, selecting methods, evaluating evidence, interpreting findings, and making final scientific decisions.

The pedagogical framework developed in this article contributes to the theoretical understanding of AI-supported research-oriented teacher education and provides methodological guidance for designing learning activities that integrate artificial intelligence with independent inquiry. Nevertheless, the proposed mechanisms and diagnostic framework remain conceptual and require further empirical examination. Future research should investigate their practical applicability, the reliability of the proposed assessment criteria, and their potential contribution to research skill development across different teacher education contexts.

Overall, the development of preservice teachers' research skills through artificial intelligence should be understood as a pedagogically guided process in which technological assistance complements, rather than replaces, human intellectual activity. Such an approach provides a foundation for preparing future teachers who are capable of conducting responsible

scientific inquiry, critically evaluating information, and applying evidence-based reasoning in their professional practice.

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IMPROVING THE METHODOLOGY FOR DEVELOPING THE PROFESSIONAL QUALITIES OF FUTURE TEACHERS BASED ON THE CREDIT-MODULE SYSTEM

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Abstract. *The article examines the methodological improvement of developing the professional qualities of future teachers within the credit-module system of higher education. Particular attention is given to the pedagogical conditions, instructional approaches, and educational mechanisms that contribute to the development of professional competence, independent learning skills, creative thinking, and practical readiness among prospective teachers. The study emphasizes the importance of aligning learning outcomes with credit-based educational requirements, integrating theoretical knowledge with practice-oriented activities, and expanding opportunities for individualized learning trajectories. Furthermore, it explores the potential of competency-based, project-based, and interactive teaching methods to enhance students’ professional development and prepare them for the changing demands of contemporary educational practice. The article proposes methodological approaches aimed at strengthening the relationship between academic content, independent student work, practical assignments, and assessment procedures.*

Keywords: *credit-module system, future teachers, professional qualities, professional competence, methodological improvement, higher education, competency-based approach, independent learning, project-based learning, pedagogical technologies, practical training, professional development.*

Introduction. In the context of the modernization of higher education, improving the methodology for developing the professional qualities of future teachers based on the credit-module system has become an important pedagogical priority. The rapid transformation of educational environments, the expansion of digital learning opportunities, and the growing demand for competency-oriented instruction require a reassessment of traditional approaches to teacher preparation. A modern teacher is expected not only to possess profound subject knowledge but also to demonstrate pedagogical creativity, critical and analytical thinking, professional responsibility, effective communication, digital competence, and the ability to make independent decisions in complex educational situations. Consequently, the quality of teacher education should be assessed not merely by the amount of theoretical knowledge acquired but also by the extent to which prospective teachers can apply that knowledge in practice, design learner-centered educational activities, and continuously improve their professional performance.

The credit-module system creates organizational and pedagogical conditions for addressing these requirements through clearly defined learning outcomes, modular curriculum structures, credit-based workload allocation, independent learning, and continuous assessment. However, the formal introduction of this system does not automatically guarantee the development of

professional qualities. Its effectiveness depends on how coherently educational objectives, teaching methods, practical assignments, independent learning activities, and assessment criteria are integrated into a unified methodological framework. Therefore, improving the methodology for developing future teachers' professional qualities should be understood as a comprehensive pedagogical process that connects the acquisition of knowledge with its practical application, the development of professional motivation, the cultivation of reflective thinking, and the gradual formation of pedagogical independence.

The international relevance of this issue is supported by UNESCO's Global Report on Teachers: Addressing Teacher Shortages and Transforming the Profession (2024), which estimates that approximately 44 million additional primary and secondary teachers will be needed worldwide by 2030 to achieve universal access to education. This projection demonstrates the scale of the global teacher-workforce challenge and reinforces the importance of improving both the availability and the quality of teacher preparation.

In this context, preparing future teachers requires more than increasing enrolment in pedagogical programmes; it also necessitates developing their capacity to respond to diverse learner needs, employ evidence-informed instructional methods, and adapt to changing educational conditions. Another important consideration is the relationship between the organization of higher education and the achievement of intended learning outcomes. According to the OECD's Education at a Glance 2025, across OECD and partner countries, 43% of students entering bachelor's programmes complete a tertiary qualification within the expected programme duration. This proportion rises to 59% when an additional year is allowed and reaches 70% after three additional years.

These figures concern programme completion rather than the professional qualities of future teachers and should not be interpreted as direct evidence of the effectiveness of any particular teaching methodology. Nevertheless, they highlight the importance of coherent programme design, appropriate academic support, clearly sequenced learning activities, and effective mechanisms for monitoring student progress. For teacher education, these considerations strengthen the case for organizing the credit-module system around meaningful learning outcomes and sustained professional development rather than treating credits as purely administrative units.

In the European context, the European Credit Transfer and Accumulation System (ECTS) provides a useful reference point for understanding the relationship between academic workload and learning outcomes. Under this framework, 60 credits generally correspond to one full-time academic year, while credits represent learning outcomes achieved through a defined amount of student work. This principle suggests that the educational value of a module should be determined by the quality and depth of the competencies developed, rather than by the number of teaching hours alone. Accordingly, future teachers' professional qualities should be incorporated into module-level learning outcomes and assessed through observable performance indicators, including lesson planning, problem-solving, communication, instructional design, and reflective evaluation.

The relevance of this issue is particularly evident in Uzbekistan, where the introduction of the credit-module system into higher education was formalized through Resolution No. 824 of the Cabinet of Ministers dated 31 December 2020. The regulation established an organizational framework for implementing the credit-module system in accordance with the European Credit Transfer and Accumulation.

This framework creates opportunities to strengthen students' independent learning, expand their participation in selecting educational pathways, and improve the transparency of academic assessment. At the same time, the pedagogical effectiveness of these opportunities depends on the extent to which independent work is supported by meaningful assignments, practical application, systematic feedback, and clearly articulated professional expectations.

From this perspective, the professional qualities of future teachers should be approached as an integrated and developing system rather than as a collection of isolated personal characteristics. For the purposes of this article, these qualities can be examined through five interrelated components: motivational and value-oriented, cognitive, operational and practical, communicative, and reflective. The motivational component encompasses professional commitment, responsibility, and a willingness to improve; the cognitive component concerns subject knowledge and pedagogical understanding; the practical component involves the ability to design and implement effective teaching activities; the communicative component relates to constructive interaction with learners and colleagues; and the reflective component enables teachers to evaluate their decisions and identify areas for further development. This component-based interpretation provides a conceptual foundation for designing learning activities that address not only what students know, but also how they act, communicate, make decisions, and evaluate their own professional performance.

The improvement of the relevant methodology therefore requires a transition from predominantly knowledge-transmission approaches towards a coherent combination of competency-based, practice-oriented, project-based, and reflective learning. Within individual modules, theoretical instruction can be linked to professional case studies, microteaching, collaborative projects, simulated classroom situations, digital learning resources, and structured independent assignments. Formative assessment and constructive feedback should accompany these activities so that students can identify gaps in their performance and progressively improve their professional skills. Importantly, such methodological integration should be adapted to the specific objectives of each pedagogical discipline and the initial preparedness of students rather than applied as a uniform set of techniques across all courses.

Looking ahead, the increasing integration of digital technologies and artificial intelligence into educational practice is likely to intensify the demand for teachers who can combine subject expertise with digital-pedagogical competence, ethical judgment, adaptability, and lifelong learning. This projection is based on current educational and technological trends rather than on a guaranteed forecast. Its realization will depend on the availability of appropriate infrastructure, institutional support, and the quality of professional preparation. Nevertheless, it provides a strong rationale for designing credit-module programmes that encourage independent inquiry, creative problem-solving, evidence-based decision-making, and continuous professional reflection.

The improvement of methodologies for developing the professional qualities of future teachers within the credit-module system represents a multidimensional research problem at the intersection of teacher education, competency-based learning, independent study, pedagogical assessment, and educational innovation. In contemporary higher education, professional development can no longer be understood as the accumulation of theoretical knowledge alone. It involves the gradual integration of subject expertise, pedagogical decision-making, professional responsibility, communication, creativity, digital competence, and reflective practice. From this perspective, the credit-module system should be examined not merely as an administrative

mechanism for allocating academic credits, but as an educational framework capable of organizing and monitoring the progressive development of future teachers' professional qualities.

International scholarship provides several complementary theoretical perspectives for understanding this process. Research conducted in the United States emphasizes pedagogical content knowledge and the integration of theory with practice, while European approaches to credit accumulation focus on learning outcomes, student workload, and academic transparency. Research on self-regulated learning highlights students' capacity to plan, monitor, and evaluate their own learning, whereas studies of formative assessment emphasize the role of feedback in improving performance. In combination, these perspectives provide a conceptual basis for designing a coherent methodology that links the objectives of individual modules with practical learning activities and measurable professional outcomes.

International theoretical foundations of professional development

One of the foundational contributions to teacher education was made by American educational researcher Lee S. Shulman. In his influential article Those Who Understand: Knowledge Growth in Teaching, Shulman [1] argued that effective teaching requires more than disciplinary knowledge; teachers must also understand how subject matter can be represented, explained, and adapted to learners' needs. His concept of pedagogical content knowledge remains relevant to the development of future teachers because it establishes a direct relationship between what teachers know and how effectively they transform that knowledge into educational practice.

LEE S. SHULMAN, 1986

Applied to the credit-module system, this perspective suggests that each module should provide opportunities for students to demonstrate their ability to translate theoretical understanding into pedagogically appropriate decisions. For example, assessment should not be restricted to recalling concepts or reproducing definitions. It should also examine whether students can select suitable teaching methods, design learning tasks, anticipate learners' difficulties, and justify their instructional choices. Consequently, methodological improvement requires a shift from predominantly knowledge-oriented assessment towards the evaluation of knowledge in action.

A related perspective is presented in the work edited by Linda Darling-Hammond and John Bransford, Preparing Teachers for a Changing World [2]. The authors emphasize the importance of combining knowledge about subject content, how learners learn, instructional strategies, classroom management, assessment, and the diverse needs of students. Their approach indicates that teacher preparation should be structured around the interconnected demands of professional practice rather than fragmented disciplinary requirements.

Wiley+1

This argument has direct implications for modular curriculum design. If individual modules operate independently without a clear relationship to the professional competencies expected of graduates, students may acquire disconnected knowledge that is difficult to apply in authentic educational situations. A more effective methodology would establish explicit links between module learning outcomes, practical assignments, teaching simulations, collaborative projects, and professional reflection. In this way, each module becomes a component of a broader developmental trajectory.

The technological dimension of professional competence is explored by Punya Mishra and Matthew J. Koehler [3] through the Technological Pedagogical Content Knowledge framework, commonly known as TPACK. Their model explains that effective technology integration requires the interaction of three knowledge domains: content, pedagogy, and technology. The authors

caution, in effect, against treating educational technology as an independent solution detached from instructional purpose.

Punya Mishra, Matthew J. Koehler, 2006+1

For future teachers, this means that digital platforms, interactive learning materials, electronic portfolios, and artificial intelligence-supported tools should be incorporated into modules according to clearly defined educational objectives. Their value lies in supporting analysis, experimentation, feedback, and independent learning rather than simply increasing the quantity of digital resources available to students. The methodological implication is that digital competence should be assessed through students' ability to select and apply appropriate tools in specific pedagogical situations.

Another important theoretical contribution concerns self-regulated learning. American psychologist Barry J. Zimmerman [4] conceptualizes self-regulation as a process involving goal setting, strategic planning, monitoring, self-evaluation, and the adjustment of learning behavior. This perspective is particularly relevant to the credit-module system because students are expected to undertake a substantial proportion of their learning independently. However, independent study does not automatically produce autonomy. Students must develop the capacity to identify learning needs, allocate time, select appropriate resources, monitor progress, and evaluate the quality of their work. Therefore, independent learning activities should be designed as structured developmental tasks rather than as supplementary assignments. A well-designed module might require students to analyze a pedagogical problem, develop a solution, justify their approach using relevant literature, implement a practical task, and evaluate the result against established criteria. Such activities can help connect academic independence with professional responsibility and reflective competence.

The importance of feedback in this process is examined by John Hattie and Helen Timperley [5] in their review, The Power of Feedback. Their analysis establishes feedback as an important influence on learning while demonstrating that its effectiveness depends on the nature of the information provided and how learners use it.

For the purposes of teacher education, feedback should explain the relationship between current performance and the intended learning outcome, identify specific areas requiring improvement, and provide actionable guidance for subsequent work. General comments such as “good performance” or “needs improvement” are less informative than feedback linked to explicit assessment criteria and observable professional behaviors.

The European Credit Transfer and Accumulation System (ECTS) provides an important reference for structuring higher education around learning outcomes and student workload. The European Commission's ECTS Users' Guide [6] explains the role of credits in supporting transparency, the recognition of learning, and student mobility across higher education institutions. Under the ECTS framework, 60 credits generally correspond to one full-time academic year, while one credit commonly represents approximately 25–30 hours of total student workload. These hours include both contact teaching and independent learning activities. The distinction is methodologically important because academic workload should be planned in relation to the outcomes students are expected to achieve, rather than being measured solely by classroom attendance.

The credit-module system can consequently support the development of professional qualities when module outcomes are formulated in terms of demonstrable performance. For example, instead of stating only that students should understand instructional planning, a module

may require them to design a lesson, justify the selection of teaching strategies, prepare assessment materials, and reflect on the anticipated learning outcomes. The credit allocation then becomes associated with a defined body of academic and practical work.

Nevertheless, credits themselves should not be interpreted as direct indicators of professional competence. A student may accumulate the required credits without demonstrating sufficient confidence in pedagogical decision-making or the ability to manage complex instructional situations. This distinction highlights the need to combine credit accumulation with criterion-referenced assessment, practical performance tasks, and continuous feedback. Statistical evidence and its implications for teacher education

International statistical evidence reinforces the importance of coherent programme design, structured professional learning, and the integration of independent and collaborative activities.

According to the OECD's Education at a Glance 2025, the average completion rate for bachelor's programmes across OECD countries and economies is 43% within the theoretical programme duration. This rises to 59% when an additional year is allowed and reaches 70% three years beyond the expected completion date. The difference between on-time completion and completion after three additional years is therefore 27 percentage points.

These statistics concern programme completion, not the professional qualities of future teachers. Nevertheless, they suggest that the organization of educational programmes, the sequencing of modules, and the provision of appropriate academic support deserve systematic attention. For teacher education, the implication is that a modular curriculum should provide transparent expectations, manageable learning pathways, timely feedback, and opportunities to address learning difficulties before they accumulate. A second source of evidence comes from the OECD's Teaching and Learning International Survey (TALIS 2018). The survey reports that more than 90% of participating teachers had engaged in at least one professional development activity during the preceding year. However, only 44% participated in professional development based on peer learning and networking, while 82% reported that their professional development activities had a positive impact on their teaching practice.

These figures should be interpreted cautiously because they reflect teachers' reported experiences rather than a controlled experimental measurement of training effectiveness. Even so, they highlight the importance of collaborative and practice-oriented professional learning. In the preparation of future teachers, this supports the use of peer assessment, collaborative projects, simulated teaching, group problem-solving, and structured reflection. Such activities can provide opportunities to explain decisions, compare alternative strategies, and learn from the experiences of others.

The OECD findings also suggest a potential imbalance between participation in professional development and engagement in collaborative forms of learning. A methodological response would be to ensure that future teachers do not simply complete individual assignments but also participate in activities that require dialogue, cooperation, peer feedback, and the joint resolution of professional problems. Whether these interventions improve outcomes in a particular higher education institution must, however, be established through empirical investigation.

The global demand for qualified teachers provides an additional contextual justification for methodological innovation. UNESCO's Global Report on Teachers [7] estimates that approximately 44 million additional primary and secondary teachers will be needed worldwide by 2030 to achieve universal access to education.

This projection concerns the global teacher workforce and does not directly measure the effectiveness of teacher education programmes. Nevertheless, it reinforces the strategic importance of developing teacher preparation systems that combine professional knowledge, practical competence, adaptability, and sustained professional learning.

In Uzbekistan, the regulatory foundation for implementing the credit-module system was established by Cabinet of Ministers Resolution No. 824 of 31 December 2020 [8]. The regulation provides for the gradual introduction of the credit-module system in higher education institutions and establishes its relationship with the European Credit Transfer and Accumulation System. Under the regulation, a student ordinarily accumulates 30 credits per semester and 60 credits per academic year. One credit generally corresponds to 25–30 academic hours, while the specified undergraduate workload distribution allocates 40–50% to contact hours and 50–60% to independent work, subject to the applicable curriculum and regulatory provisions.

These provisions create organizational opportunities for developing professional qualities through independent assignments, practical activities, and individualized learning pathways. However, the proportion of time allocated to independent study should not be equated with the quality of independent learning. The educational value of this component depends on the complexity of the tasks, the availability of learning resources, the quality of academic guidance, and the extent to which students receive meaningful feedback. Therefore, the principal methodological challenge is to transform the formal workload structure into a coherent sequence of developmental activities that produce observable professional outcomes.

The reviewed literature reveals several complementary dimensions of professional development: Shulman's pedagogical content knowledge explains the relationship between subject expertise and teaching practice; Darling-Hammond and Bransford emphasize the integration of professional knowledge and instructional practice; Mishra and Koehler highlight the interaction of technology, pedagogy, and content; Zimmerman explains the role of self-regulated learning; and Hattie and Timperley clarify the contribution of feedback to learning improvement. The ECTS framework and Uzbekistan's regulatory provisions provide the organizational basis for translating these principles into modular learning structures.

Despite their complementary contributions, these perspectives address different levels of the educational process. The existence of a credit system does not itself guarantee professional development, just as the use of digital technologies or independent assignments does not automatically result in improved pedagogical competence. The methodological task is therefore to establish a systematic relationship between intended learning outcomes, the design of module content, practice-oriented learning activities, independent work, feedback, and assessment.

For the purposes of this study, the research gap is defined as the need for an integrated methodology that connects the organizational principles of the credit-module system with the progressive development and systematic assessment of future teachers' professional qualities. This formulation does not imply that previous studies have ignored these relationships entirely. Rather, it identifies the specific integration problem addressed by the present article.

The results of the study on improving the methodology for developing the professional qualities of future teachers within the credit-module system indicate that the effectiveness of teacher education depends not only on the volume of theoretical knowledge acquired but also on the systematic integration of practical activities, independent learning, formative assessment, and reflective practice. From this perspective, the credit-module system should be understood not merely as an administrative mechanism for allocating academic workload, but as a pedagogical framework that

enables the gradual development of professional competence through measurable learning outcomes.

A synthesis of the theoretical framework and methodological approaches identified in the study suggests that the development of future teachers' professional qualities can be structured around five interrelated components: motivational and value-oriented, cognitive, operational and practical, communicative, and reflective and self-regulatory. These components function as a coherent system: motivation supports sustained engagement in professional learning; cognitive development provides the conceptual foundation for pedagogical decision-making; practical competence enables the application of knowledge in authentic educational situations; communication facilitates productive interaction with learners and colleagues; and reflection allows future teachers to evaluate their performance and identify areas for improvement.

The proposed methodological framework comprises four consecutive but interconnected stages: diagnostic and goal-setting, content and instructional design, practical and developmental learning, and assessment and reflection. At the diagnostic stage, students' initial knowledge, learning needs, and professional aspirations are identified. During instructional design, learning outcomes are aligned with module content, independent assignments, and assessment criteria. The practical stage incorporates problem-based tasks, pedagogical simulations, collaborative projects, and microteaching activities. Finally, assessment and reflection enable students to compare their performance with predetermined learning outcomes and establish individual development priorities. Such a sequence creates a structured relationship between academic content, practical application, and evidence-based evaluation.

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STATISTICAL ANALYSIS OF THE EFFECTIVENESS OF DIGITAL INSTRUCTION IN INTEGRATED SCIENCE: EVIDENCE FROM A PEDAGOGICAL EXPERIMENT

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Abstract. *This article re-examines the distributions of grades recorded in experimental and comparison groups studying integrated Science in grades 5–6 of general secondary schools in a digital learning environment. The dissertation's tables for 2023, 2024, and 2025 contain 608 group-year observations: 306 in experimental groups and 302 in comparison groups. Weighted mean grades, Welch's independent-samples t test, and Pearson's chi-square test were recalculated directly from frequencies across four grade categories using explicit formulas. In 2025, the experimental group had a mean grade of 3.962 and the comparison group a mean of 3.408; the recalculated statistics were Welch $t \approx 4.54$ and $\chi^2 \approx 21.29$. Both tests indicated a statistically significant between-group difference. At the same time, because the available information is aggregated by year and group, the article emphasizes the need for caution when interpreting the findings causally.*

Keywords: *integrated Science, digital instructional methodology, pedagogical experiment, Welch's t test, Pearson's chi-square test, mean grade, educational effectiveness.*

Аннотация. *В статье проведён повторный статистический анализ сводных результатов оценивания экспериментальных и контрольных групп по интегрированному предмету Science в 5–6-х классах. Данные за 2023–2025 гг. включают 608 наблюдений по группам и годам: 306 в экспериментальных и 302 в контрольных группах. По распределению оценок рассчитаны средние значения, критерий t Уэлча и критерий χ^2 Пирсона. В 2025 г. средний балл экспериментальной группы составил 3,962, контрольной — 3,408; получены $t \approx 4{,}54$ и $\chi^2 \approx 21{,}29$, что указывает на статистически значимое различие. Разграничены абсолютная разница средних, разница в процентных пунктах и относительное отношение. Отмечены ограничения сводных данных при причинной интерпретации.*

Ключевые слова: *Science, цифровая педагогика, педагогический эксперимент, критерий Уэлча, χ^2 Пирсона, успеваемость.*

INTRODUCTION

The value of a methodological proposal for teaching natural sciences in a digital environment cannot be judged solely by the creation of a new platform or a bank of interactive tasks. To establish its relationship with educational outcomes, results from experimental and comparison groups must be evaluated using consistent criteria, and statistical methods must be appropriate to the nature of school grades. In integrated Science, where the content of several

disciplines is brought together, it is particularly important to make explicit which aspect of learning is being measured.

In educational research, the general statement ‘effectiveness has increased’ may refer to a higher mean grade, a larger share of high grades, or a measure normalized to the rating scale. These quantities are not equivalent. Similarly, a t test from the Student family examines differences between means, while Pearson’s χ^2 test examines the independence of categorical distributions. They are not two notations for the same statistic.

The aim of this article is to recalculate the experimental and comparison-group outcomes from the dissertation’s aggregated grade tables for 2023–2025, interpret the statistical differences, and clarify both the scope and the limitations of conclusions about the proposed instructional approach. Unlike an article describing the instructional model itself, the present study focuses on the precise interpretation of available quantitative evidence.

RESEARCH MATERIAL AND STUDY DESIGN

The analysis used the frequencies of grades 2, 3, 4, and 5 for experimental and comparison groups in the dissertation’s results tables covering three years. The original study is described as having been conducted at seven general secondary schools in Tashkent city and in Surkhandarya and Fergana regions. The dissertation states that the research work took place between 2023 and 2026, but only the numerical series available for 2023–2025 were analyzed here. No separate numerical observations from 2026 were added to these calculations.

The numbers of students vary by year: 98 and 100 in 2023, 102 and 99 in 2024, and 106 and 103 in 2025, for experimental and comparison groups, respectively. Thus, the three annual data sets comprise 306 experimental-group observations and 302 comparison-group observations. Because individual identifiers do not establish whether the same learners participated in more than one year, these records were not treated as evidence of continuous three-year growth for particular students. This distinction is important for interpreting the results.

Table 1. Frequency distribution of grades by year and group

Year and group	Grade 2	Grade 3	Grade 4	Grade 5	Total
2023 — experimental	19	36	28	15	98
2023 — comparison	18	36	30	16	100
2024 — experimental	12	32	36	22	102
2024 — comparison	15	35	32	17	99
2025 — experimental	4	24	50	28	106
2025 — comparison	19	38	31	15	103

All subsequent calculations were performed using the integer frequencies in Table 1. Data checking began by verifying row totals and the overall group counts; mean grades, sample variances, test statistics, and p values were then calculated separately. The analysis did not simply

copy the dissertation's existing interpretations. By stating the basis of calculation, it makes the results reproducible.

STATISTICAL METHODS

First, the mean grade for each group was calculated as a frequency-weighted arithmetic mean: $\bar{x} = (2n_2 + 3n_3 + 4n_4 + 5n_5) / N$, where n_2, n_3, n_4, and n_5 are the numbers of students receiving each grade and N is the group size. For example, the 2025 experimental group yields $(2 \times 4 + 3 \times 24 + 4 \times 50 + 5 \times 28) / 106 = 420/106 = 3.9623$, while the comparison group yields $(2 \times 19 + 3 \times 38 + 4 \times 31 + 5 \times 15) / 103 = 351/103 = 3.4078$.

Second, Welch's t test was used to compare the means of two independent groups. Unlike the equal-variance version, this test does not assume that both groups have exactly the same variance: $t = (\bar{x}_1 - \bar{x}_2) / \sqrt{(s_1^2/n_1 + s_2^2/n_2)}$. The degrees of freedom were estimated by the Welch–Satterthwaite formula: $\nu = (a + b)^2 / [a^2/(n_1 - 1) + b^2/(n_2 - 1)]$, where $a = s_1^2/n_1$ and $b = s_2^2/n_2$. The approximate normality and treatment of grades as numerical scores were considered as assumptions. Because grades are ordinal categories, a test of means was not used as the sole form of evidence.

Third, Pearson's χ^2 test of independence was applied to the 2×4 frequency table: $\chi^2 = \Sigma(O_{ij} - E_{ij})^2/E_{ij}$. The expected frequency in each cell was calculated as E_{ij} = (row total × column total)/grand total. The degrees of freedom were $(2 - 1) \times (4 - 1) = 3$; at $\alpha = 0.05$ the critical value is 7.815. Since the χ^2 statistic is already a sum of squared standardized deviations, taking its square root to turn it into a t statistic or comparing it with the critical value of another test would be mathematically incorrect.

Fourth, differences were expressed in three distinct units: (a) the raw difference in mean grades; (b) the percentage-point difference after normalizing the means to a maximum grade of five; and (c) the ratio of the two means. Cohen's d and Cramér's V were also calculated to distinguish statistical significance from the magnitude of the observed difference. Two-sided hypothesis tests were assessed at $\alpha = 0.05$.

RESULTS

Table 2. Mean grades and between-group differences

Year	Experimental mean	Comparison mean	Difference	Welch's t	Two-sided p
2023	3.398	3.440	−0.042	−0.305	0.761
2024	3.667	3.515	0.152	1.131	0.259
2025	3.962	3.408	0.555	4.537	< 0.001

In 2023, the two groups had almost identical mean grades; the experimental group's mean was actually 0.042 points lower. Welch's test yielded $t \approx -0.305$ and $p \approx 0.761$, indicating no statistically significant difference. This is consistent with the absence of a large discrepancy at baseline, but it does not establish that the groups were identical in all unobserved characteristics.

In 2024, the mean grade was 3.667 in the experimental group and 3.515 in the comparison group, a difference of 0.152 points. Although the direction of the difference was positive, it did not reach statistical significance ($t \approx 1.131$; $p \approx 0.259$). Thus, improvements in selected indicators can be described, but the 2024 comparison alone should not be presented as conclusive evidence of effectiveness.

The 2025 results showed a clearer difference: $\bar{x} = 3.9623$ for the experimental group and $\bar{x} = 3.4078$ for the comparison group. The mean difference was 0.5545 points; Welch's $t \approx 4.537$, the estimated degrees of freedom $\nu \approx 199.17$, and $p \approx 0.00000985$. The approximate 95% confidence interval for the mean difference was 0.313–0.795 points. Because this interval does not include zero, the difference between the groups in 2025 was statistically significant.

Table 3. Comparison of grade distributions using Pearson's chi-square test

Year	Observed χ^2	Degrees of freedom	Critical χ^2 (α = 0.05)	p value
2023	0.108	3	7.815	0.991
2024	1.299	3	7.815	0.729
2025	21.292	3	7.815	< 0.001

Pearson's test gave results in the same direction. In 2023, $\chi^2 \approx 0.108$, and in 2024, $\chi^2 \approx 1.299$; both values were below the critical threshold of 7.815. In 2025, $\chi^2 \approx 21.292$ and $p \approx 0.0000915$, so the null hypothesis that the four grade categories had the same distribution in both groups was rejected. This does not mean that the statistical test proved the groups were taught with different methods. The teaching methods were specified in advance by the research design; χ^2 tests whether grade distributions are associated with group membership.

The pattern of grades also differed in educationally meaningful ways. In 2025, 78 learners in the experimental group received grades 4 or 5, representing 73.58% of the group; in the comparison group, 46 learners received grades 4 or 5, or 44.66%. The difference in the proportion of high grades was 28.92 percentage points. A separate measure—the mean normalized to the maximum grade of five—was 79.25% for the experimental group and 68.16% for the comparison group, a difference of 11.09 percentage points. These two differences have different denominators and cannot be substituted for one another.

The ratio of mean grades was $3.9623/3.4078 \approx 1.163$; in other words, the experimental mean was approximately 1.16 times the comparison mean. This corresponds to a relative increase of approximately 16.3%. It would be incorrect to equate this figure with an '11.09% increase': 11.09 refers to a difference in normalized percentage points, whereas 16.3% represents the relative difference between the two means.

For the magnitude of the observed difference, the 2025 Cohen's d was approximately 0.63, while Cramér's V for the association between grade categories and group membership was approximately 0.319. These additional descriptive statistics help to assess whether the observed difference is more than a purely sample-size-driven significance finding. They do not, however, eliminate potential confounding factors in the research design.

DISCUSSION

The findings indicate that the experimental group, which implemented the digital integrated Science instructional package, had higher grades than the comparison group in the 2025 data. The absence of statistically significant differences in 2023 and 2024, followed by a larger difference in 2025, is consistent with the hypothesis of a sustained instructional process. At the same time, because the annual data sets have not been verified as a panel tracking the same students over time, it would be unwarranted to claim that individual learners improved continuously over three years.

Interpretation of these results should return to the didactic mechanisms of the intervention. The proposed system goes beyond digital content itself: initial diagnostic assessment, observation and experimentation, evidence-based tasks, rubrics, feedback, and reflection are organized as a sequence. Research by Black and Wiliam [1] and Hattie and Timperley [3] helps explain why evidence of student learning and well-designed feedback matter for instruction. However, the available aggregated grades do not identify the contribution of each component. The results therefore cannot reasonably be attributed exclusively to a virtual laboratory, the platform, or any single assessment technique.

A further issue is the ordinal nature of school grades. Although means and t tests are often applied to grades in educational studies, the psychological distance between grades 2 and 3 has not been demonstrated to be identical to that between grades 4 and 5. Pearson's χ^2 test provides supplementary evidence by comparing the full distribution of categories. If future studies preserve individual test scores, rubric levels, motivation scales, and school identifiers, ordinal or multilevel models could be used as appropriate.

The limitations of this analysis must be stated explicitly. First, aggregated tables do not allow individual pre- and post-assessment scores to be linked. Second, insufficient detail is available about random assignment to groups or school- and teacher-related factors. Third, p values from simple t and χ^2 tests may understate uncertainty when within-school or within-class dependence is ignored. Fourth, individual-level evidence of motivation and scientific explanation is not included in the frequency tables considered here. The statistical conclusions of this article are therefore limited to the distribution of grades.

These limitations do not negate the findings; rather, they define what can be concluded from them. A statistically significant difference is directly observed in the 2025 grades. Identifying which components of the digital instructional system produced this difference would require more detailed and appropriately controlled analysis. Future investigations could strengthen the methodological conclusions by recording outcomes separately for each school, the specific methods implemented, teachers' preparation, and the reliability of scoring rubrics.

CONCLUSIONS AND PRACTICAL RECOMMENDATIONS

First, the dissertation's grade frequencies show no statistically significant difference between the experimental and comparison groups in 2023 ($p \approx 0.761$). In 2024, although the mean difference favored the experimental group, it also failed to reach the significance threshold ($p \approx 0.259$). Neither year alone should be interpreted as definitive proof of instructional effectiveness.

Second, in 2025 the mean grade was 3.962 in the experimental group and 3.408 in the comparison group, and the difference was statistically significant under both Welch's t test ($t \approx 4.537$) and Pearson's χ^2 test ($\chi^2 \approx 21.292$). This between-group difference is important empirical evidence that warrants further rigorous evaluation of the proposed instructional package.

Third, reporting the 2025 results requires keeping separate the mean grade difference (0.555 points), the difference after normalization to the maximum grade (11.09 percentage points), and the ratio of means (approximately 1.16). Treating these measures as interchangeable would misrepresent the statistical findings.

Fourth, future empirical studies should maintain linked records of results by school, class, and teacher, individual pre- and post-assessment scores, CER rubrics, and motivation questionnaires. Such records would make it possible to investigate not only the overall difference, but also which aspects of interdisciplinary understanding, practical competence, and motivation may account for observed changes.

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WHEN A HIGH SCORE CONCEALS WEAK VERIFICATION: A VALIDITY AUDIT OF A SIX-FACTOR UNIVERSITY MEDIA-LITERACY INDEX

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Abstract. *This conceptual and mathematical study examines a six-factor index proposed for diagnosing university students' information culture and media literacy. The source assigns expert-derived weights to six domains, reports Kendall's concordance of .82 for 20 academics, and defines three diagnostic bands; it provides no student-level observations. Drawing on assessment-validity theory, we test what the index can legitimately establish. A compensation analysis shows that a fact-checking score of 44 out of 100 can meet the 'strategic' cutoff of 86 when the other five domain scores are 100. A compensation-frontier figure displays the full mathematical boundary without inventing participants or findings. The analysis distinguishes an informative summary score from evidence of indispensable competence. It recommends reporting component profiles and validating any additional minimum-performance requirements before consequential classification. Numerical agreement among experts is valuable, but neither agreement nor normalized weights can certify the meaning of a student's score.*

Keywords: *media literacy, information culture, educational assessment, composite indices, validity, fact-checking*

Introduction

University students must authenticate digital claims, protect personal information, use artificial intelligence judiciously, and produce lawful, responsible media. These capacities are related but not interchangeable. A polished portfolio does not demonstrate the ability to detect a forged image; reliable fact-checking does not establish competence in citation or privacy. Yet a composite score can absorb such differences into one number. The question is not whether aggregation is convenient but whether the conclusions drawn from it exceed the evidence supplied by its components.

Urazimbetov's (n.d.) Uzbek-language paper proposes a six-factor qualimetric index for higher education. Twenty academics reportedly evaluated the relative importance of its factors, with Kendall's W = .82. Fact-checking receives the largest coefficient, .25; the others address media law and security, AI and cyberhygiene, content creation, academic integrity, and resistance to manipulation. The article specifies instruments and performance bands but includes neither student records nor the expert rankings needed to independently examine its claims.

This study argues that the central validity problem is compensation: strong performance in one domain can conceal failure in another, even when the latter is assigned the highest weight. We reconstruct the index, derive its strategic-classification boundary, and propose a distinction between descriptive scoring and defensible readiness decisions. The contribution is analytical rather than empirical: it identifies an assumption hidden in a seemingly objective formula and specifies the evidence required to justify that assumption.

The audit addresses score interpretation rather than individual achievement. A model may be coherent as an instructional planning device and still require different evidence when used to certify readiness. This distinction is decisive because the same index can support both cautious feedback and overconfident labeling if its purpose is not specified.

Literature Review

Media literacy is a practice of inquiry and communication, not a single cognitive trait. UNESCO (2021) locates critical engagement alongside access, participation, and citizenship; Hobbs (2017) emphasizes the decisions involved in creating as well as interpreting digital materials. These perspectives support varied assessments but do not imply that every component should be interchangeable. A student's ability to produce an attractive message and ability to establish its truth may have different importance depending on the educational decision.

Composite indices invite two assumptions: that component scores can be compared on a common scale and that their weighted sum represents the construct of interest. Bloom's (1956) taxonomy distinguishes forms of cognitive performance, but does not validate a particular aggregation rule. The central distinction is between describing relative achievement and certifying that a minimum competence has been demonstrated. The former may tolerate trade-offs; the latter may not.

Validity concerns the interpretations and uses made of scores. Messick (1995) and the Standards for Educational and Psychological Testing (American Educational Research Association et al., 2014) require evidence about construct representation, response processes, scoring consistency, fairness, and consequences. Expert agreement can support the rationale for a weighting scheme, but cannot establish that simulated tasks reflect authentic behavior or that a numerical cutoff separates competent from unprepared learners.

Generative AI sharpens these concerns. Guidance from Miao and Holmes (2023) treats human agency, privacy, and responsible educational use as matters of governance, not merely technical proficiency. Detecting an error in generated prose may demonstrate useful skepticism; a detector's claim that prose is AI-written cannot, by itself, establish academic misconduct. Assessment must distinguish demonstrated reasoning from the output of a tool and from unsupported moral inference.

The source's related publications (Urazimbetov, 2024, 2025) frame the development and indicators of students' media and information culture. The present analysis retains their locally situated concern while examining a more specific question: what can be inferred when six diverse observations are reduced to one score? Bibliographic details for these two publications are reproduced as given in the source and were not independently verified.

Method

We conducted documentary reconstruction and deterministic sensitivity analysis of the uploaded Uzbek-language manuscript (Urazimbetov, n.d.). The six constructs, instruments, weights, expert-panel information, and diagnostic thresholds were translated into English and treated as reported model specifications, not independently confirmed empirical results. Scholarly sources on literacy and validity informed the interpretation. No participants were recruited and no student scores were created.

Let F1–F6 denote domain scores on 0–100 scales: legal/security knowledge; AI/cyberhygiene; fact-checking; safe content creation; academic integrity; and media resilience. The stipulated weights are $\beta = (.20, .15, .25, .15, .15, .10)$. The index is $I = \Sigma\beta iFi$, with weights summing to 1. The original categories are critical (0–55), functional (56–85), and strategic (86–

100). Their origins and error rates are not reported. Table 1 gives the assessment instruments and the validity questions each raises.

To examine compensation, we isolated F3, the highest-weighted factor, and defined R as the weighted mean of the other five: R = (.20F1 + .15F2 + .15F4 + .15F5 + .10F6)/.75. Thus I = .25F3 + .75R. At any threshold T, the boundary is R = (T − .25F3)/.75. Figure 2 plots the feasible strategic boundary for T = 86; Figure 1 shows the original weights. These are algebraic displays, not estimated trends or hypothetical sample distributions.

We also reviewed each instrument for construct coverage and irrelevant influences. Since the model is linear, a one-point change in Fi alters I by βi; equally weighted changes in opposing directions can cancel. The proposed remedy-reporting all six domain scores and testing supplementary minimum-performance requirements-is therefore an unvalidated design proposition rather than a demonstrated intervention.

Table 1

Six-factor assessment architecture and required validation evidence

Domain	Weight	Source instrument	Priority validation question
F1: Law/security	.20	Scenario-based test	Jurisdiction and scenario sampling
F2: AI/cyberhygiene	.15	Error-detection case	Rubric accuracy; tool access
F3: Verification	.25	Authentication simulation	Transfer across media; time bias
F4: Content creation	.15	Portfolio defense	Authorship and rater consistency
F5: Integrity	.15	Attribution audit	Do not equate detector with misconduct
F6: Media resilience	.10	Self-report questionnaire	Response validity; desirability bias

Note. Weights and instruments are transcribed from Urazimbetov (n.d.); validation questions are the present analysis.

Analysis

Figure 1 makes the index's value judgments explicit. A ten-point increase in verification (F3) raises the total by 2.5 points; ten additional points in media resilience (F6) raise it by 1. These are arithmetic exchange rates, not estimated causal effects. Calling them objective weights risks obscuring the expert and institutional judgments they embody.

Consider a score profile with F3 = 44 and all five other domains at 100. Its total is .25(44) + .75(100) = 86, exactly the original strategic threshold. A learner can therefore receive the highest category despite a verification score below half of the available points. This is a counterexample, not an observed case; it disproves the inference that the strategic label necessarily entails strong verification. With F3 = 40 and all other scores at 100, I = 85 instead.

Figure 2 shows the boundary beyond this single example. When F3 = 44, the remaining-domain average R must equal 100 to attain I = 86. At F3 = 60, R must be approximately 94.67; at F3 = 80, R must reach 88. For F3 = 40, the required R exceeds 100 and is impossible. The diagram

represents the region in which compensation can occur, not its frequency among students. It exposes a consequential fact: maximal emphasis on a component is not the same as requiring competence in it.

Compensation is not always inappropriate. An index intended for formative feedback may reasonably reward broad achievement while retaining identifiable weaknesses. A strategic-readiness classification makes a stronger claim. If inability to authenticate a deceptive claim jeopardizes the very practice being certified, allowing strengths in media design or legal knowledge to offset that failure requires justification. The formula decides the trade-off silently unless the institution makes its intended use explicit.

The reported Kendall's W = .82 indicates substantial rank agreement among the 20 experts if calculated correctly, but it does not validate score meaning. Concordance cannot show whether experts represented students or professional fields, whether weight magnitudes are defensible, or how tied rankings were handled. Without the underlying rankings and elicitation protocol, the statistic cannot be independently reproduced. Agreement on priorities should not be mistaken for proof that the resulting score categories work.

Each assessment instrument also carries distinct uncertainty. Legal scenarios depend on applicable jurisdiction. AI-error cases require documented errors and rubrics that distinguish justified corrections from guesses. Timed fact-checking simulations may confound verification with connectivity, language proficiency, or interface familiarity. Portfolios permit authentic production but introduce differences in resources and assistance. These threats affect the meaning of a 0–100 score before weighting even begins.

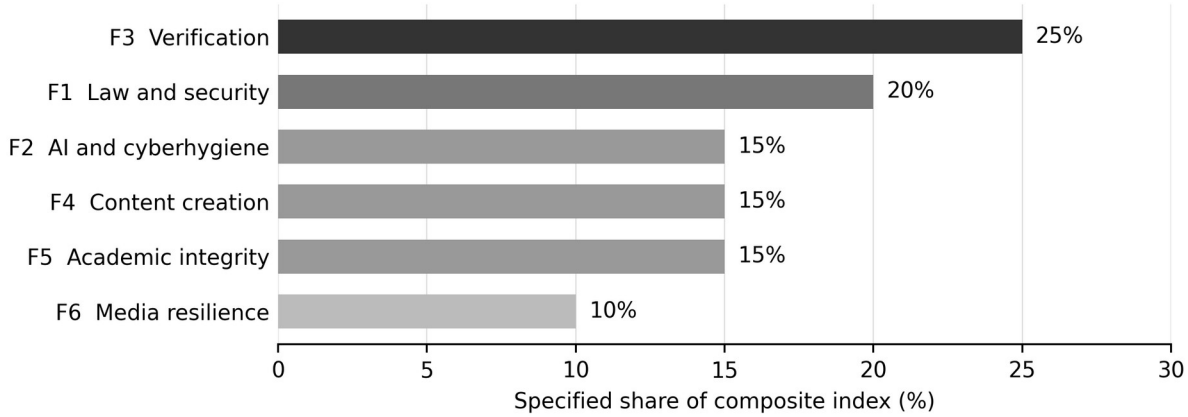
The integrity and resilience measures require particular caution. A text-similarity percentage cannot establish plagiarism without examining attribution and context; an AI detector does not replace evidence or due process. Likewise, a questionnaire about resistance to manipulation may measure socially desirable answers rather than decisions made under pressure. These instruments may still inform teaching, but their scores should not support declarations about character, honesty, or immunity without corroborating behavioral evidence.

The score bands also leave a technical decision unarticulated. The factors may be assigned integer scores, yet their weighted sum can contain decimals: values between 85 and 86, for example, do not fall within the source's stated integer ranges unless a rounding convention is imposed. A score of 85.8 could be classified differently under rounding, truncation, or continuous cutoffs. These differences matter most near boundaries, where modest scoring error can change a learner's label. Before implementing the index, institutions should state whether thresholds operate on raw totals or rounded values, verify the reliability of the underlying domain scores, and refrain from claiming categorical precision that the instruments cannot support.

The low-score band reveals the same inferential error in reverse. A composite below 56 cannot establish an integrity violation, although the source describes the critical level using such broad language. Low scores could arise in other domains while integrity remains high. No total uniquely identifies a component unless its mathematical bounds force that conclusion. Consequently, diagnostic labels should describe performance under specified tasks, not assign motives or imply misconduct.

Figure 1

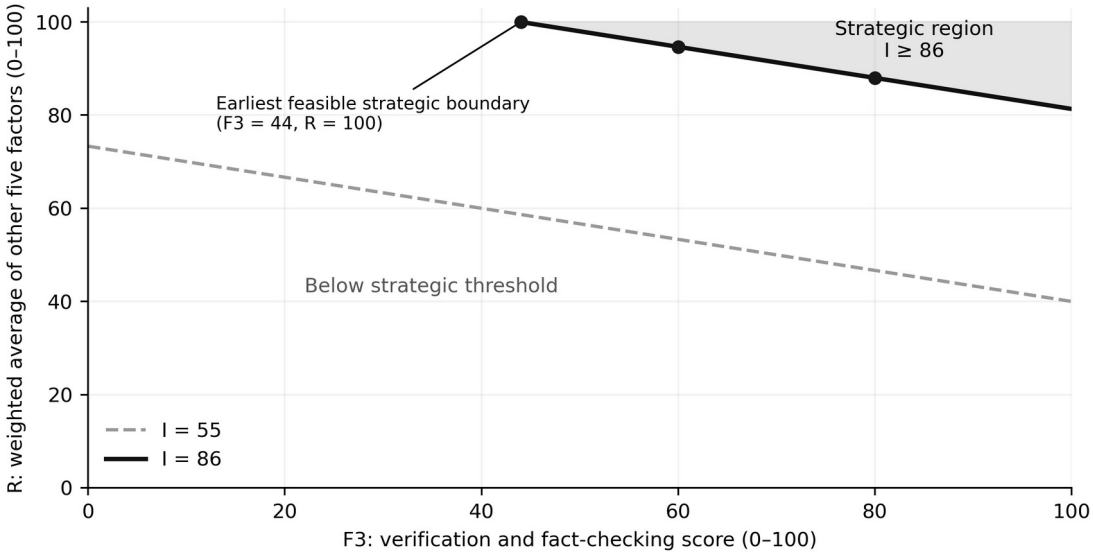
Specified coefficients in the six-factor composite



Note. The bars show design weights, not observed student scores. Source: Urazimbetov (n.d.).

Figure 2

Compensation frontier for the original strategic classification



Note. R is the weighted mean of the five factors other than F3. Threshold lines follow I = .25F3 + .75R; plotted points are algebraic cases, not student observations (Urazimbetov, n.d.).

Discussion

A defensible scoring architecture should distinguish a descriptive index from a decision rule. Retain I for summarizing achievement, but report the full six-factor profile alongside it. Where an institution intends to certify safe independent action, it could additionally require a validated minimum on designated essential tasks: for example, strategic designation would require I ≥ 86 and satisfaction of a separate verification criterion. The criterion's value cannot be chosen here; stakeholders and outcome evidence must determine it.

This distinction avoids treating holistic and domain-specific assessment as rivals. An aggregate indicates performance under selected weights; a minimum requirement asks whether an indispensable capability has been shown. When they disagree, the disagreement is useful information. It should guide targeted instruction and reassessment rather than disappear behind a favorable total.

Prospective research should establish task specifications, scoring rubrics, and defensible

cutoffs. Independent raters need to score verification explanations and portfolios, with consistency estimated across raters and task forms. Assessments should sample text, image, video, and AI-mediated claims; repeated tasks should test transfer rather than presume it. Response-process interviews can distinguish sound reasoning from accidental success. Fairness analysis should investigate language, technology access, disability accommodation, and discipline before institutions compare groups or attach sanctions to scores.

Weight sensitivity also merits direct testing. If plausible expert-weight configurations reverse classifications for many learners, categories are unstable even when the original coefficients sum neatly to one. Institutions should compare rules against consequential outcomes and investigate the costs of false assurance and unnecessary remediation. A low-stakes learning dashboard and a high-stakes integrity proceeding cannot responsibly depend on the same unexamined threshold.

Language matters. ‘Media immunity’ implies durable protection against deception that a brief questionnaire cannot verify. More accurate reports describe the task, conditions, demonstrated strategy, and remaining uncertainty. Similarly, integrity evidence should concern attribution, disclosure, and documented practice, not a vendor-generated suspicion score.

A further reason to separate profiles from decisions is that media-literacy failure is context-dependent. In a journalism practicum, inability to verify an image may invalidate a publishable product, regardless of the quality of its design. In a digital-citizenship course, equitable participation and responsible communication may warrant a different configuration of priorities. Neither case implies a universal ranking of moral worth or competence. Rather, the intended activity must determine which evidence is indispensable and which strengths legitimately compensate for deficits. In that sense the compensation frontier is also a policy diagnostic: it displays trade-offs that educators and affected students should scrutinize before score labels acquire institutional force. A transparent rationale is more defensible than one supposedly neutral set of weights for every setting.

An actionable report can display the six scores, instruments, scoring qualifications, and the total as a secondary indicator. Weak verification would then identify a need for focused practice even when other strengths lift I into the strategic band. This preserves the source model’s diagnostic ambition without pretending that its arithmetic alone establishes readiness, fairness, or misconduct.

Limitations

This analysis is limited to documents and algebra. The uploaded source provides no student-level dataset, expert-ranking matrix, item analyses, reliability estimates, or independent criterion measures. The reported W and weights cannot be rechecked, and the figures describe possible profiles rather than observed prevalence. Neither the proposed safeguard nor its fairness has been empirically tested. Source bibliography entries with incomplete metadata have not been supplemented with conjectural details.

Conclusion

The six-factor model provides a useful starting vocabulary for teaching and assessing contemporary media literacy. Its weighted total, however, permits a strategically classified score even when verification-the most heavily weighted domain-remains weak. This conclusion is mathematical, not a claim about how many students have such profiles.

A credible next step is to preserve domain-specific evidence, validate each instrument, test the consequences of cutoffs, and justify any competence that must not be compensated away. The

point is not to abandon qualimetry, but to make its numerical conveniences accountable to the educational decisions they inform.

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TEACHING THE INVISIBLE: A CONSTRAINT-FIRST DECISION MODEL FOR SELECTING PEDAGOGICAL TECHNOLOGIES IN MEDICAL MICROBIOLOGY

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Abstract. *Medical microbiology occupies an unusual position in the medical curriculum: its objects are almost never seen directly, yet graduates must reason about them from stains, colonies, reaction patterns, and laboratory reports. Methodological guidance in Uzbekistan and the wider Russian-language literature typically responds with lists of criteria for choosing teaching technologies. This article argues that such lists, however sound their individual items, conceal a structural problem, because they treat criteria of different logical kinds as if they could be traded against one another. Using a conceptual model-building design, the study derives eight selection criteria from the literature, sorts them into three tiers (non-compensatory gates, discipline-specific epistemic criteria, and calibration criteria) and applies an explicit 0–2 affordance appraisal to ten teaching technologies. Two of the eight criteria proved relational: they describe a match between a technology and an outcome or a cohort and cannot be scored as properties of the technology. Of the 60 attributable judgements, 26 were conditional rather than direct. Additive totals favoured case analysis, problem-based tasks, and laboratory work, yet only concept mapping and comparison tables cleared both the feasibility and the assessability thresholds unconditionally. The resulting coupling principle holds that a technology chosen for its inferential demand should be paired with one that leaves an assessable trace. The model is offered as an analytic proposal for empirical testing, not as evidence of differential effectiveness.*

Keywords: *medical microbiology education, constructive alignment, pedagogical technology selection, multi-criteria decision-making, representational reasoning, laboratory biosafety.*

Introduction

Few subjects in the medical curriculum ask students to reason so confidently about things they will never see. A physician does not observe *Neisseria meningitidis* in a patient's cerebrospinal fluid. She reads a report of Gram-negative intracellular diplococci, sets it against fever, neck stiffness, and a petechial rash, and acts within the hour. Medical microbiology is, in this precise sense, an inferential discipline. Its working knowledge travels through a chain of representations: the stained smear, the colony on blood agar, the colour shift in a biochemical panel, the zone of inhibition around an antibiotic disc, and now the sequence read. The competence that matters clinically is the ability to move along that chain without breaking it.

That observation has consequences for how the subject should be taught, and it is largely missing from the methodological literature on which teachers in Uzbekistan and neighbouring systems currently draw. National reform has made the choice of teaching method a matter of institutional accountability. The 2030 concept for higher education commits universities to competence-oriented curricula and to modern teaching technologies (President of the Republic of Uzbekistan, 2019), echoing the wider international shift toward outcome-defined medical training

(Frank et al., 2010; Frenk et al., 2010). In the Russian- and Uzbek-language tradition this is usually framed as the selection of *pedagogical technologies*, a deliberately broad category that covers concept maps, case tasks, role-play, and virtual laboratories alike.

Methodological guidance in this tradition usually answers the selection problem with a list of things a teacher should weigh. Novelty is not among them, and rightly so: a technology earns its place by what it does for a particular learning task. Drawing on constructive alignment (Biggs, 1996), on practice-oriented approaches to microbiology developed in Russian medical universities (Podgrushnaya, 2021; Podgrushnaya et al., 2019), and on the international evidence reviewed below, eight such considerations can be identified for microbiology classes: alignment with intended outcomes, fit with content and its complexity, students' preparedness, continuity between theory and laboratory work, orientation to clinical and professional situations, laboratory resources and biosafety, student activity and collaboration, and the capacity for assessment and feedback.

Each criterion is defensible on its own. The difficulty lies in their arrangement. Presented as a flat list, they invite a teacher to reason additively, as though a technology that is weak on biosafety could be redeemed by being strong on engagement. Some criteria plainly do not work that way. Others, on inspection, do not describe a technology at all but a relation between a technology and something outside it. A list that mixes these kinds gives no rule for resolving conflicts, and conflicts are exactly where selection becomes difficult.

This article builds the eight criteria into a decision model. It asks three questions. First, what logical status does each criterion hold? Second, how do commonly used technologies distribute their affordances across the criteria that can properly be attributed to them, and does a tiered reading alter the ranking an additive reading would produce? Third, what design principle follows for microbiology teaching? The contribution is analytic. The model has not been tested against learner outcomes, and nothing below should be read as evidence that one technology outperforms another.

Literature Review

Alignment and the Question of What a Technology Contributes

Biggs (1996) argued that teaching works when intended outcomes, learning activities, and assessment tasks share the same verbs. If students are meant to *interpret* a laboratory result, the activity must require interpretation and the assessment must elicit it. Biggs and Tang (2011) later made the corollary explicit: an activity is chosen for what it makes learners do, not for its name. Applied to microbiology, the principle becomes concrete. An outcome about explaining bacterial morphology calls for visual material and explanatory tasks; an outcome about analysing laboratory results calls for comparison and argument from evidence.

An older argument sharpens the point. Clark (1994) maintained that media never influence learning; methods do, and any medium capable of delivering a method will produce equivalent results. Kozma (1994) replied that some media make certain methods possible that others cannot support. The exchange was never settled, but its residue is useful. A selection criterion that rates "virtual laboratories" or "role-play" as such rates the wrong object. What deserves appraisal is the method a technology enables and the conditions under which it enables it.

The evidence on active learning is consistent with this caution rather than a substitute for it. Freeman et al. (2014) found across 225 studies in science, engineering, and mathematics that students taught by traditional lecturing were 1.5 times more likely to fail than those taught with active methods. The finding is strong; the category is loose. It tells a microbiology teacher that something other than uninterrupted lecturing is warranted, not which activity serves which

outcome.

Problems, Cases, and the Guidance Dispute

Problem-based and case-based formats have the strongest presence in medical education and the most contested evidence base. Hmelo-Silver (2004) described problem-based learning as a means of building flexible knowledge, reasoning, and self-direction, while noting that its outcomes depend heavily on facilitation. Kirschner et al. (2006) attacked minimally guided instruction on cognitive-load grounds: novices lack the organised knowledge needed to search a problem space productively. Hmelo-Silver et al. (2007) replied that well-designed problem-based learning is in fact heavily scaffolded. Both sides, then, converge on guidance as the variable that decides whether a problem format teaches anything.

The convergence matters for microbiology because the element interactivity of its problems is unusually high. Identifying a likely pathogen requires holding morphology, staining reaction, growth requirements, biochemical profile, and clinical context in view at once. Norman (2005) concluded from decades of clinical-reasoning research that diagnostic skill depends on how knowledge is organised rather than on a general, transferable reasoning ability. Cases are therefore best understood as vehicles for organising microbiological knowledge around clinical use. The systematic review by Thistlethwaite et al. (2012) found case-based learning widely valued by students and teachers, though much of the evidence rested on perception rather than measured outcomes. One caution follows for microbiology teaching: a clinically framed task builds reasoning, but it must not be confused with authorising students to make independent clinical decisions.

Laboratories, Simulations, and Biosafety

The practical laboratory occupies a special position. De Jong et al. (2013) concluded that physical and virtual laboratories each offer distinct advantages and that combinations often outperform either alone. In microbiology specifically, Makransky et al. (2016) randomly assigned 189 undergraduate students to prepare for a streak-plate exercise either through a virtual simulation or a live tutor demonstration and found no significant difference in subsequently assessed laboratory performance. The design is important: the simulation prepared students for the bench; it did not replace it.

Biosafety introduces a constraint of a different order. Guidelines developed for teaching laboratories by the American Society for Microbiology specify practices according to biosafety level and treat the choice of organism as a precondition of the exercise (Emmert & ASM Task Committee on Laboratory Biosafety, 2013). The World Health Organization (2020) has moved toward a risk-based rather than a purely category-based approach, which places the burden of local risk assessment on the institution. Neither framework treats safety as one consideration to be balanced against learner interest.

Representations as the Object of Learning

The literature reviewed so far concerns methods. A further strand concerns what is being learned. Ainsworth (2006) showed that multiple representations serve three functions: they complement one another, constrain interpretation, and support the construction of deeper understanding, provided learners grasp how each representation maps onto the domain. Curricular guidelines in microbiology have likewise moved from coverage toward conceptual understanding and scientific thinking (Merkel & ASM Task Force on Curriculum Guidelines for Undergraduate Microbiology, 2012). Taken together, these sources suggest that in microbiology the representation is not an aid to the content. To a large extent it *is* the content. Guidance on selecting

teaching technologies still tends to treat micrographs and schematics as visual support for morphology topics. That framing understates their role and leaves the inferential character of the discipline without a corresponding criterion.

Method

Design

The study follows a conceptual model-building design. Jaakkola (2020) distinguishes model papers from theory syntheses and typologies by their aim: to specify how constructs relate so that the relations can later be tested. The criteria were derived by analytic synthesis of the literature reviewed above, following the logic of qualitative document analysis (Bowen, 2009): each source was read for the selection considerations it implies, and overlapping considerations were merged. No human participants were involved and no ethical approval was required.

Criteria and Technologies

The synthesis produced eight criteria, numbered C1–C8 in the order given in the introduction. Outcome alignment (C1) and assessment and feedback (C8) derive from constructive alignment and the formative-assessment literature (Biggs, 1996; Black & Wiliam, 1998). Content fit (C2) draws on work on representations and conceptual understanding (Ainsworth, 2006; Merkel & ASM Task Force on Curriculum Guidelines for Undergraduate Microbiology, 2012), and preparedness (C3) on the guidance debate (Hmelo-Silver et al., 2007; Kirschner et al., 2006). Theory–laboratory continuity (C4) and clinical orientation (C5) reflect practice-oriented microbiology teaching and case-based learning (Podgrushnaya, 2021; Thistlethwaite et al., 2012). Resources and biosafety (C6) follow biosafety guidance (Emmert & ASM Task Committee on Laboratory Biosafety, 2013; World Health Organization, 2020), and activity and collaboration (C7) the active-learning evidence (Freeman et al., 2014). Ten technologies in common use in medical microbiology classes were then selected for appraisal: explanatory lecture with guiding questions, visual materials (micrographs and digital microscopy images), concept mapping, comparison and classification tables, problem-based tasks, clinical case analysis, role-play and simulation games, supervised wet-laboratory practicals, virtual laboratories, and small-group discussion.

Analytic Procedure

Analysis proceeded in three stages. In the first, each criterion was subjected to two tests. The compensatory test, borrowed from multi-criteria decision analysis (Belton & Stewart, 2002), asked whether a deficit on the criterion could reasonably be offset by a surplus elsewhere. The attributability test asked whether the criterion described a property of the technology or a relation between the technology and something else, such as a particular outcome or cohort.

In the second stage, the ten technologies were appraised against every attributable criterion on a three-point scale fixed before scoring began. A score of 2 indicated a *direct* affordance: the technology in its ordinary form satisfies the criterion. A score of 1 indicated a *conditional* affordance, present only when a specific design element is added, and the required element was recorded. A score of 0 indicated no inherent affordance or a counter-affordance. Two criteria were operationalised with care. Content fit (C2) was reformulated as inferential demand: whether the technology requires students to draw conclusions from a mediated representation of microorganisms. Resources and biosafety (C6) were scored as feasibility, so that 2 denotes low resource and biosafety burden.

The third stage compared additive totals with a gated reading in which the non-compensatory criteria were examined separately.

Trustworthiness

The appraisal was conducted by a single analyst, and the scores are judgements rather than measurements. To make them auditable, the full matrix is reported, each score is traceable to a decision rule, and readers can re-score any cell and observe the effect on the conclusions.

Results

The Criteria Are Not of One Kind

The two tests separated the eight criteria into three tiers (Table 1). Three criteria failed the compensatory test. A technology that does not serve the intended outcome (C1) cannot be rescued by its engagement value, and an exercise that cannot be run safely with the available resources (C6) cannot be offset by anything at all. Assessment and feedback (C8) also belong here, which may seem counter-intuitive, since assessment is usually treated as a step that follows selection rather than a condition of it. Under constructive alignment an outcome is only aligned if an assessment task can evidence it; a technology whose results leave no observable trace cannot, by definition, be aligned, however engaging it is.

Table 1

Logical Status of the Eight Source Criteria in the Tiered Selection Model

Source criterion	Tier	Logical status	Reformulated decision question	Primary decision level
C1 Outcome alignment	I. Gate	Non-compensatory; relational	Does the activity require the verb named in the intended outcome?	Teacher, within course outcomes
C6 Resources and biosafety	I. Gate	Non-compensatory; attributable	Can the exercise run safely with the containment, equipment, and supervision available?	Institution
C8 Assessment and feedback	I. Gate	Non-compensatory; attributable	Will the activity leave an observable trace that evidences the outcome?	Department and teacher
C2 Content fit (as inferential demand)	II. Epistemic	Compensatory; attributable	Does it require inference from a mediated representation of microorganisms?	Department (curriculum)
C4 Theory–laboratory continuity	II. Epistemic	Compensatory; attributable	Does it connect a representation to the procedure that produced it?	Department (curriculum)
C5 Clinical orientation	II. Epistemic	Compensatory; attributable	Does it carry the inference into a clinical decision without conferring clinical authority?	Department (curriculum)
C3 Learner preparedness	III. Calibration	Compensatory; relational	How much staging and scaffolding does this cohort need?	Teacher
C7 Activity and collaboration	III. Calibration	Compensatory; attributable	How should grouping and independence be arranged?	Teacher

Note. Criteria are derived from the sources listed in the Method section. Tier assignments, reformulated questions, and decision levels are the author's analysis. Non-compensatory = a deficit cannot be offset by strength on another criterion (Belton & Stewart, 2002). Relational = the criterion describes a match between a technology and an outcome or cohort rather than a property of the technology.

Two criteria failed the attributability test. Outcome alignment (C1) is a relation between a technology and a stated outcome; concept mapping is well aligned to an outcome about relations among virulence factors and poorly aligned to one about aseptic technique. Preparedness (C3) is a relation to a cohort. It seldom decides whether a technology is used; it fixes the form the technology takes, its level of complexity, and the support students receive. C3 is therefore best read as calibrating enactment. So does C7: grouping and the degree of independence shape how a case or problem is run, but they rarely decide whether it is run.

The remaining three criteria (C2, C4, C5) are where microbiology's particular character enters. Each concerns a link in the representational chain described earlier: reading the representation, connecting it to the laboratory procedure that produced it, and carrying the inference into a clinical decision.

Affordance Profiles

Table 2 presents the appraisal. Because C1 and C3 are relational, they were not scored, which leaves 60 attributable judgements across ten technologies.

Table 2

Affordance Appraisal of Ten Teaching Technologies Against the Six Attributable Criteria

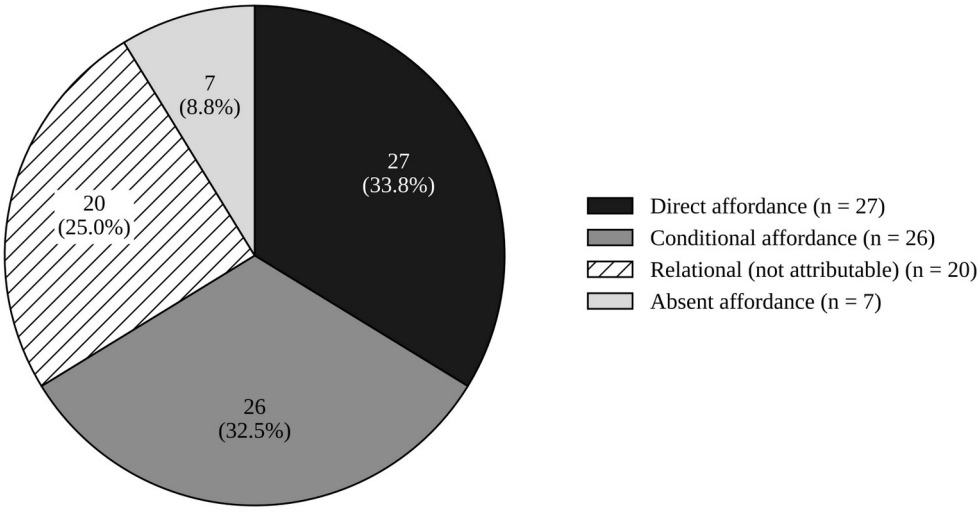
Technology	C2	C4	C5	C6	C7	C8	Total (/12)
Explanatory lecture with guiding questions	1	0	1	2	1	1	6
Visual materials (micrographs, digital images)	2	1	1	2	1	1	8
Concept mapping	1	0	0	2	2	2	7
Comparison and classification tables	1	1	0	2	1	2	7
Problem-based tasks	2	1	1	2	2	1	9
Clinical case analysis	2	1	2	2	2	1	10
Role-play and simulation games	1	0	2	2	2	1	8
Wet-laboratory practical (supervised)	2	2	1	0	2	2	9
Virtual laboratory	2	1	1	1	2	2	9
Small-group discussion	1	0	1	2	2	1	7
Column total (maximum = 20)	15	7	10	17	17	14	80

Note. 2 = direct affordance; 1 = conditional affordance; 0 = absent affordance or counter-affordance. C2 = inferential demand; C4 = theory–laboratory continuity; C5 = clinical orientation; C6 = feasibility (2 = low resource and biosafety burden); C7 = learner activity and collaboration; C8 = assessability and feedback. C1 and C3 are relational and were not scored. Principal conditions recorded: C8 = 1 for case analysis, problem-based tasks, role-play, and discussion requires a specified written or structured product; C6 = 1 for the virtual laboratory reflects licence and device requirements; C6 = 0 for the wet laboratory reflects the need for prior institutional biosafety assessment (Emmert & ASM Task Committee on Laboratory Biosafety, 2013; World Health Organization, 2020).

Figure 1 places these judgements within the full set of 80 technology–criterion pairings implied by the eight criteria. Only about a third (27, 33.8%) were direct affordances. Twenty-six (32.5%) were conditional, and a further 20 (25.0%) could not be attributed to the technology at all. Taken together, 46 of the 80 pairings (57.5%) depend on something other than the technology itself, whether a design element, an outcome, or a cohort. Only seven pairings (8.8%) recorded an absent affordance.

Figure 1

Distribution of the 80 Technology–Criterion Pairings by Affordance Type



Note. Pairings combine ten technologies with the eight selection criteria. The 20 relational pairings correspond to C1 and C3, which cannot be scored as properties of a technology. Percentages are of all 80 pairings. Data derived from the appraisal in Table 2.

The epistemic tier deserves separate comment because the profiles there are uneven in ways an overall total hides. Only the wet laboratory provides a direct link between a representation and the procedure that produced it (C4 = 2); every other technology reaches that link conditionally or not at all. Direct clinical orientation (C5 = 2) appears in just two technologies, case analysis and role-play. Visual materials, which are usually assigned to morphology topics, score at the maximum on inferential demand, because reading a Gram-stained smear or a colony photograph is itself an act of inference. Treated as illustration, such material is underused. Treated as evidence to be interpreted, it becomes one of the cheapest ways of training the first link in the chain.

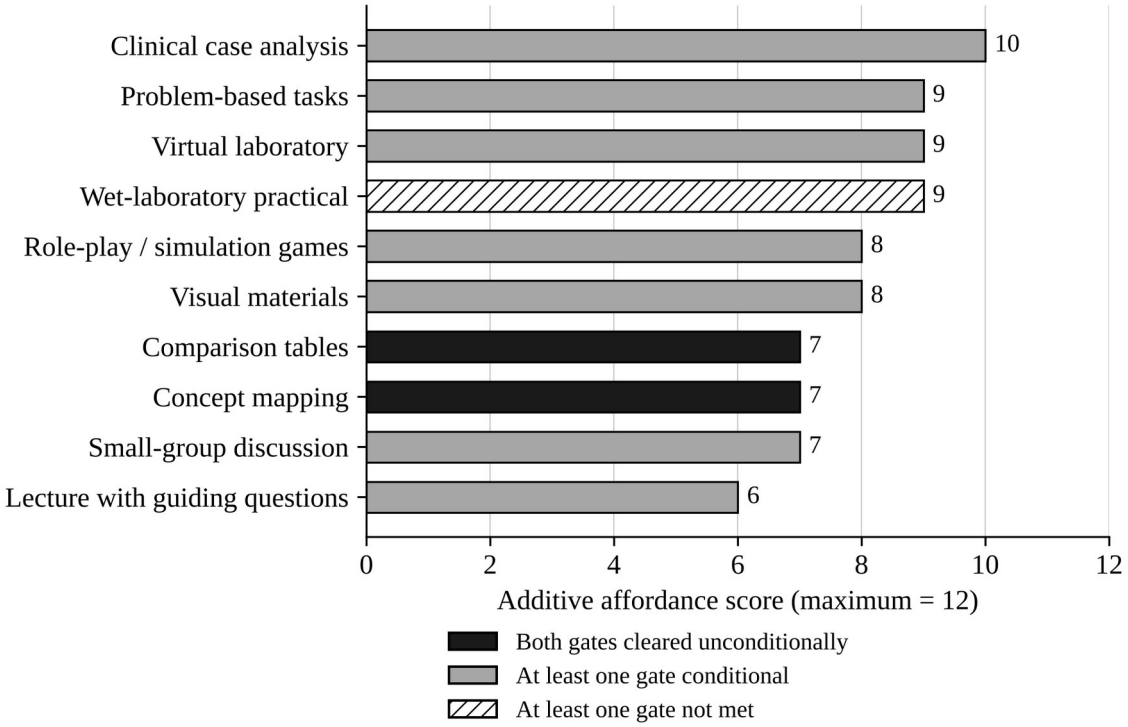
This distribution supports the Clark–Kozma residue noted earlier. In the large majority of cases the question "does this technology meet the criterion?" cannot be answered without specifying how it will be used.

Additive and Gated Readings Diverge

Figure 2 ranks the technologies by their additive totals and shades each bar by its status on the two attributable gate criteria, feasibility (C6) and assessability (C8).

Figure 2

Additive Affordance Scores of Ten Teaching Technologies, Shaded by Status on the Gate Criteria



Note. Gate status refers to the two attributable gate criteria, feasibility (C6) and assessability (C8). Cleared unconditionally = both scored 2; conditional = at least one scored 1 and none scored 0; not met = at least one scored 0. Data derived from Table 2.

Read additively, clinical case analysis leads with 10 of 12 points, followed by problem-based tasks, wet-laboratory practicals, and virtual laboratories at 9. The spread is narrow (6 to 10), which means additive scoring discriminates poorly between candidates. Much of that compression comes from feasibility: eight of the ten technologies score the maximum on C6, so the criterion adds almost equally to every total and contributes little to the ranking.

The gated reading tells a different story. Only concept mapping and comparison tables cleared both gate criteria unconditionally, and both sit near the bottom of the additive ranking. Each of the four highest-scoring technologies depends on a condition. Case analysis and problem-based tasks are assessable only when a written product is specified, the virtual laboratory depends on licences and devices, and the wet laboratory fails the feasibility gate in its unconditioned form. That last result should not be misread. It does not mean wet work should be avoided. It means the decision to include it is taken at a different level, by an institution that has assessed organisms, containment, and supervision, before any pedagogical comparison begins.

Discussion

The Coupling Principle

The divergence between the two readings yields the study's central proposal. The technologies with the highest inferential demand (case analysis, problem-based tasks, role-play) tend to have conditional assessability. The technologies with the most secure assessability (concept maps, comparison tables) have modest inferential demand. These profiles are complementary, which suggests a rule for combining them: *a technology chosen for its inferential demand should be coupled with one chosen for the assessable trace it leaves.*

Consider a case of suspected urinary tract infection in which the laboratory reports a Gram-negative rod. Discussed orally, the case may generate excellent reasoning that the teacher can neither see in full nor give feedback on. If the group must also complete a comparison table stating which findings would discriminate *Escherichia coli* from *Proteus mirabilis* (lactose fermentation on MacConkey agar, urease activity, swarming motility) and justify the order in which tests would be requested, the reasoning becomes inspectable. Feedback can then address the specific inferential step that went wrong, which is the condition Hattie and Timperley (2007) identified for feedback to change performance, and which Black and Wiliam (1998) placed at the centre of formative assessment.

Combining methods is hardly a new recommendation. The coupling principle differs in specifying the rule of combination. Methods are not combined because variety is good, nor merely because each serves a stage of the lesson; they are combined so that a high-demand activity is matched with a low-demand artefact across the assessability gate. This also aligns with Ainsworth's (2006) account of complementary representations: the table constrains the interpretation that the case leaves open.

An objection should be met here. Experienced teachers rarely reason in tiers; they weigh considerations together and trade them off, often well. The model does not deny this. Within the epistemic and calibration tiers it assumes exactly that kind of compensatory judgement. Its claim is narrower: trade-offs become illegitimate once they reach across a gate. No gain in engagement justifies an unassessable activity in a course that claims to be outcome-based, and no gain in authenticity justifies an exercise the laboratory cannot contain. Stating these limits explicitly protects the compensatory judgement that remains, because it confines that judgement to the questions it can answer.

Representations Before Organisms

Reformulating content fit as inferential demand has a curricular implication. A course that proceeds taxon by taxon invites technologies chosen for each organism group. A course organised around links in the representational chain invites technologies chosen for each kind of inference. On this view, interpretation of microscopy is served by visual material and virtual microscopy; identification from culture and biochemical profile by comparison tables followed by wet work; and interpretation of susceptibility results by case analysis, where a reported resistance pattern must be translated into a treatment choice. Miller's (1990) distinction between knowing how and showing how marks the point at which the wet laboratory becomes irreplaceable: only there does a student demonstrate an inference while also producing the evidence it rests on.

Decision Levels and the Uzbek Context

The three tiers map onto three levels of decision-making, and this may be the model's most practical feature. Gate criteria are largely institutional: biosafety containment, laboratory equipment, and software licences are decided by faculties and administrations, not by individual

teachers. Epistemic criteria are curricular and belong to departments designing a course sequence. Calibration criteria belong to the teacher planning a particular session for a particular group.

Lists that place all eight criteria in front of the individual teacher assign responsibility for decisions the teacher cannot make. In Uzbek medical universities, where laboratory provision varies considerably between institutions, this has practical consequences. A teacher in an under-equipped department who is handed such a checklist may conclude that practice-oriented teaching is out of reach. The tiered model separates the issues. Where the feasibility gate is closed for wet work on a given topic, the evidence supports virtual laboratories as preparation (Makransky et al., 2016) rather than as replacement (de Jong et al., 2013), and it supports pressing the institution to reopen the gate rather than treating the gap as a pedagogical given.

Limitations

The appraisal was carried out by one analyst, and an ordinal scale with three points is coarse. Other analysts might reasonably score particular cells differently, especially where "ordinary form" is contestable: some teachers would regard a role-play without a structured debriefing as no role-play at all. The eight criteria and the ten technologies were selected by the author, and the percentages in Figure 1 describe that set rather than microbiology teaching in general. The Uzbek-language methodological literature was not reviewed systematically, so the model may omit considerations that matter in local practice. Most fundamentally, the model makes no claim about learning outcomes. Its propositions, particularly the coupling principle, are testable but untested.

Three lines of inquiry follow. A Delphi panel of microbiology educators could test whether the tier assignments hold across institutions. Independent re-scoring of the matrix would establish inter-rater agreement. A quasi-experimental comparison of coupled and uncoupled lesson designs, with analytic reasoning on laboratory interpretation tasks as the outcome, would test the principle directly.

Conclusion

Choosing a teaching technology for microbiology is not a matter of finding the item with the most ticks. It is a sequence of decisions of different kinds, made at different levels by different people. Gates come first, and they are mostly not the teacher's to open. Epistemic fit comes next, and in microbiology it turns on whether a technology trains students to infer from representations of organisms they will rarely see directly. Calibration comes last, shaping how a chosen technology meets a particular group.

Within that sequence, the analysis points to one practical rule. Pair the activity that demands reasoning with the artefact that makes reasoning visible. The rule is modest and it is falsifiable. It is offered in that spirit, as a proposal for the empirical work that the present framework still requires.

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PEDAGOGICAL CONDITIONS AND METHODOLOGICAL MECHANISMS FOR DEVELOPING ETHICAL AND CULTURAL RELATIONS AMONG PROSPECTIVE TEACHERS

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Abstract. *This conceptual study examines how prospective teachers can develop ethical and cultural relations as an integrated dimension of professional preparation. The inquiry uses a focused interpretive synthesis of scholarship on moral character, care ethics, culturally responsive pedagogy, reflective practice and school-based teacher education, together with international competence frameworks. The analysis distinguishes the knowledge of ethical rules from the relational capacity to exercise judgement in culturally diverse educational situations. It identifies four mutually reinforcing pedagogical conditions: a coherent ethical environment, inclusive dialogic interaction, supervised reflection and authentic school–community engagement. On that basis, a developmental model is proposed that connects ethical case analysis, intercultural dialogue, reflective mentoring and practice-based feedback. Two tables specify the conditions, observable indicators and assessment evidence appropriate for teacher-education courses and practicums. The framework is intended as a theoretically grounded instructional design, not as an empirically validated intervention. It offers a practical basis for curriculum planning and future evaluation, particularly in programs preparing teachers to work with children and families.*

Keywords: *prospective teachers; ethical culture; cultural relations; teacher education; professional judgement; reflective practice; intercultural dialogue; pedagogical conditions.*

INTRODUCTION

The professional preparation of a teacher is often described in terms of subject knowledge, instructional design and classroom management. These capacities are indispensable, yet they do not fully explain the quality of educational interaction. Teachers continuously make decisions about fairness, confidentiality, respect, participation and the treatment of difference. Such decisions are ethical because they affect the dignity and interests of learners; they are cultural because their interpretation takes place through language, social norms, relationships and institutional expectations. Biesta [1] therefore argues that educational professionalism cannot be reduced to the execution of techniques: it necessarily entails judgement about the purposes of education. For prospective teachers, the capacity to establish ethically justified and culturally attentive relations should be developed deliberately rather than assumed to emerge automatically from pedagogical experience.

In this article, ethical and cultural relations are defined as professionally regulated interactions in which the teacher recognises the equal dignity of participants, interprets cultural differences without stereotyping, communicates respectfully and assumes responsibility for the consequences of pedagogical action. This definition goes beyond polite behaviour or formal observance of institutional rules. It includes the ability to listen to a family concern without

prejudice, respond to a discriminatory remark without humiliation, safeguard a child's privacy, and reconcile a community expectation with the rights and educational needs of an individual learner. Such situations are especially instructive for prospective preschool and school teachers, because early educational encounters also shape children's experience of belonging and trust.

International policy frameworks reinforce the educational significance of these capacities. The Council of Europe [2] groups democratic and intercultural competence around values, attitudes, skills, and knowledge with critical understanding; UNESCO [11, 12] emphasises human dignity, solidarity, care, cultural diversity and constructive dialogue. These frameworks do not supply a ready-made lesson plan for a particular university, however. The research problem is the methodological gap between broadly accepted ethical principles and the concrete conditions through which student teachers learn to enact those principles during coursework, simulations and field placement. The aim of the study is to conceptualise those conditions, identify mechanisms of formation and propose observable indicators suitable for subsequent pedagogical evaluation.

LITERATURE REVIEW

Moral education scholarship provides a first line of explanation. Narvaez and Lapsley [6] distinguish between making the moral consequences of ordinary teaching explicit and deliberately organising instruction for character development. Their distinction is important because teacher education contains an implicit moral curriculum: the way a lecturer deals with disagreement or unequal participation can confirm or undermine the ethical principles taught in class. Osguthorpe [8] similarly treats teachers' moral dispositions not as decorative personal traits but as qualities that modify how professional methods are used. Consequently, a pedagogical module devoted to values cannot compensate for an institutional climate in which feedback is arbitrary or students' voices are routinely disregarded.

The relational dimension is developed in Noddings' ethics of care [7], which directs attention to responsiveness and concrete encounters rather than abstract compliance alone. Care should not be interpreted as the absence of professional boundaries or as unequal indulgence. In education, an ethical relationship combines attention to particular needs with justified limits, transparency and accountability. Cultural responsiveness adds another indispensable element. Ladson-Billings [5] positions learners' cultural knowledge and identities within educational practice rather than treating them as obstacles. Paris [9] advances this perspective by arguing for pedagogies that sustain linguistic and cultural plurality. Taken together, these accounts suggest that ethical culture develops when respect becomes a pattern of interaction and when difference is approached through inquiry rather than deficit assumptions.

A third strand concerns professional learning through reflection and practice. Korthagen [3] connects teachers' behaviour and competencies with beliefs, professional identity and mission, while Korthagen and Vasalos [4] explain why reflection sometimes has to address the deeper assumptions guiding practical decisions. Schön [10] views professional judgement as something refined in uncertain situations through reflection-in-action and guided inquiry. Zeichner [13] demonstrates the need to connect university knowledge with practitioner and community expertise instead of organising teacher education around a one-directional transfer of theory. This literature makes a strong case for supervised ethical practice: prospective teachers need to interpret real or credible dilemmas, receive non-punitive feedback, revise their reasoning and test alternative ways of acting.

Across these strands, a shared limitation becomes visible for curriculum design. Ethical dispositions, intercultural competence and reflective teaching are frequently discussed as distinct

areas, whereas prospective teachers must employ them simultaneously. A respectful conversational style is inadequate without fairness; rule-following is insufficient without sensitivity to context; and positive attitudes remain untested until expressed in professional action. The present study therefore integrates these domains into a single formation framework. It does not claim that the cited authors have established an identical model; the integration is an analytical proposal developed from their complementary contributions.

MATERIALS AND METHODS

The study employs a conceptual, interpretive research design. Its material consists of selected peer-reviewed publications and scholarly books addressing the moral dimensions of teaching, ethics of care, culturally responsive education, reflective professional development and university–school partnerships, supplemented by the Council of Europe competence framework [2] and UNESCO policy documents [11, 12]. The core corpus includes thirteen identifiable sources, selected for their direct theoretical relevance and their usefulness for translating normative concepts into teacher-education activities. This is a focused purposive literature synthesis, not a systematic review or meta-analysis; no exhaustive database coverage, pooled effect estimate or quantitative generalisation is asserted.

The analysis proceeded through four interpretive operations. First, recurring constructs were extracted from the literature: dignity, moral judgement, reciprocity, cultural recognition, reflective agency and situated practice. Second, these constructs were grouped by their pedagogical functions—normative orientation, interpersonal enactment, self-correction and transfer to authentic contexts. Third, the resulting categories were translated into implementable conditions and instructional mechanisms, with attention to the distinction between an institutional condition and a student learning activity. Fourth, proposed indicators were examined for observability and the risk of confusing outward conformity with ethically reasoned action. The analytic product is a framework and assessment plan; its psychometric validity and causal effectiveness require future empirical investigation.

For contextual application, the framework is considered in relation to higher-education programs preparing teachers in Uzbekistan, particularly those linked to preschool education. Examples involving teacher–family communication, multilingual interaction, inclusion and classroom disagreement are illustrative design scenarios rather than empirical statements about the prevalence of particular problems in local institutions. This boundary is essential: the article identifies what could be implemented and assessed but does not report interviews, experimental groups, participant numbers or observed effect sizes.

RESULTS: A CONCEPTUAL FRAMEWORK

Pedagogical conditions for ethical and cultural formation

The first outcome of the synthesis is the identification of four conditions that should be considered together. Normative coherence means that lecturers, practicum supervisors and institutional procedures communicate compatible expectations about respect, fairness, academic integrity and safeguarding. An isolated ethics lecture has limited formative value when daily practice contradicts it. A second condition, inclusive dialogic interaction, provides structured opportunities to encounter diverse interpretations and to justify one’s own position without coercion. The third condition, mentored critical reflection, enables students to make their assumptions discussable and to re-examine decisions after feedback. The fourth condition, authentic school–community engagement, connects university activities with the responsibilities and relational complexity of educational work [3, 4, 7, 13].

Table 1. Proposed pedagogical conditions and mechanisms of implementation

Condition	Operational mechanism	Illustrative teaching activity
Normative coherence	Shared ethical criteria; consistent feedback; educator modelling	Analyse conflicting responses to confidentiality and fairness
Inclusive dialogue	Perspective-taking; guided deliberation; intercultural communication	Discuss a culturally sensitive teacher–family disagreement
Mentored reflection	Reflective journal; structured supervision; feedback revision	Revisit a practicum dilemma using an evidence–action log
Authentic engagement	Supervised field tasks; community partnership; collaborative planning	Co-design an inclusive communication plan with a mentor

The conditions in Table 1 are conceptually distinct but causally interdependent as a design hypothesis. Institutional consistency establishes credible expectations; dialogue makes competing interpretations visible; reflection supports personal responsibility; and practicum participation offers a situation in which judgement becomes action. The model consequently resists an exclusively declarative approach in which students memorise a list of virtues. It also avoids reducing cultural competence to ceremonial knowledge about traditions. The core pedagogical question is whether prospective teachers can identify ethically consequential features of a situation, interpret culturally shaped perspectives and provide a reasoned, proportionate response.

Methodological mechanisms: from deliberation to action

Ethical case analysis is the entry mechanism. Students receive short, plausible scenarios that contain a genuine tension rather than an obvious correct answer: a family requests confidential information about another child; a child's home language is treated as an obstacle; or a group member is excluded because of a social stereotype. Instead of naming a virtue in general terms, each student identifies the stakeholders, the relevant rights and responsibilities, the missing information and at least two defensible courses of action. A case is pedagogically productive when it makes the cost of each option visible and requires an argument grounded in respect, non-discrimination and the educational purpose of the decision [1, 6, 12].

Dialogic role-play constitutes the second mechanism. Prospective teachers alternately assume the positions of educator, child or learner advocate, parent, supervisor and observer. The task is not to imitate a cultural identity or to assign fixed characteristics to social groups. Rather, participants practise asking clarifying questions, distinguishing evidence from assumptions, expressing disagreement without humiliation and negotiating a response consistent with a child's interests. Debriefing focuses on linguistic choices, turn-taking, boundary setting and recognition of the interlocutor's perspective. The emphasis on sustaining cultural and linguistic plurality follows the educational rationale presented by Ladson-Billings [5] and Paris [9].

A third mechanism is the guided reflection cycle: describe an incident; identify the ethically salient issue; examine the assumptions and emotions shaping the first response; compare alternative interpretations; formulate a revised course of action; and record what future evidence could confirm improvement. A mentor should discuss not only whether the student followed a

prescribed rule but also why an action was selected and how it affected the other participants. This aligns the development of professional judgement with the reflective approaches of Schön [10] and Korthagen and Vasalos [4]. Reflection is treated as a disciplined inquiry supported by supervision, not as an unstructured expression of personal opinion.

The fourth mechanism is supervised transfer to practice. A student may prepare an inclusive announcement for families, plan a cooperative group activity that avoids exclusion, or document how a mentor resolves a disagreement while preserving confidentiality. The university supervisor and placement mentor should assess the justification of the action, its communicative quality and its fit with the institutional setting. Zeichner's account of university–field connections [13] supports the rationale for this joint responsibility. Such tasks also permit students to encounter differing professional perspectives and to adapt theoretical principles to the complexity of practice, without treating either academic or practitioner knowledge as infallible.

A developmental approach to assessment

The framework calls for formative assessment of professional reasoning and conduct rather than a single numerical rating of personal morality. Four dimensions are proposed: ethical recognition, intercultural communication, reflective justification and responsible enactment. Evidence can be assembled from anonymised written case responses, observed role-play, structured reflection notes and mentor feedback. The assessor should seek consistency across tasks while retaining the possibility that a student performs differently under different conditions. Performance indicators are therefore descriptions of an expected professional action, not claims that a stable moral trait has been directly measured.

Table 2. Proposed observable indicators and evidence sources

Dimension	Observable indicator	Appropriate evidence
Ethical recognition	Identifies affected persons, rights, duties and competing interests	Annotated dilemma analysis
Intercultural communication	Uses non-stereotyping language; seeks clarification; listens respectfully	Role-play observation record
Reflective justification	Explains a decision, acknowledges limitations and revises assumptions	Structured reflective account
Responsible enactment	Chooses a proportionate response and documents follow-up	Supervised practicum task

A practical rubric may describe each dimension at four developmental levels: emerging, developing, proficient and reflective transfer. At the emerging level, a student names a general rule but overlooks affected stakeholders or alternative explanations. Developing performance includes a relevant justification yet requires prompting to recognise contextual tensions. Proficient performance combines accurate ethical reasoning with respectful communication and feasible action. Reflective transfer adds evidence that the student can adapt the judgement to a new situation, explain trade-offs and revise practice in the light of feedback. These level descriptions are proposed for instructional use only; before any high-stakes assessment they would need clearer task-specific anchors, assessor training and reliability checks.

Curricular sequence and safeguards for implementation

In the rehearsal stage, students conduct brief simulated conversations with rotating roles and receive targeted feedback from peers and an instructor. Feedback criteria should focus on the

clarity of reasoning, accuracy of interpretation and respectfulness of language, rather than confidence or rhetorical fluency alone. Subsequently, the transfer stage links one selected dilemma to a supervised practicum activity, such as preparing a family-facing communication or facilitating inclusive cooperation among children. A final comparative reflection asks the student to contrast the initial decision with the response developed after consultation and field experience. This sequence combines reflective inquiry with a more equal exchange between academic and practitioner knowledge [4, 10, 13].

Implementation also requires ethical protection of those involved. Cases derived from school experience should be anonymised, children and families must not be identifiable in student portfolios, and sensitive incidents should be discussed within appropriate supervisory arrangements. Role-play should never require students to disclose personal beliefs or impersonate a marginalised group through stereotypes. If evaluation is planned, the rubric must be piloted with multiple assessors and revised where descriptors generate inconsistent judgements. A curriculum team should additionally review whether the tasks provide equitable opportunities for participation in different languages and communication styles. These safeguards express the same commitments to dignity, inclusion and responsible educational practice that the model seeks to develop [2, 7, 12].

DISCUSSION

The principal contribution of the proposed model is its treatment of ethical and cultural relations as an enacted, context-sensitive aspect of teacher competence. The literature on moral dispositions [6, 8] explains why professional conduct cannot be detached from character and values. Care ethics [7] highlights attentiveness and responsibility in concrete relationships. Culturally relevant and sustaining pedagogy [5, 9] adds the need to recognise and support learners' languages and social identities. Reflective teacher education [3, 4, 10] clarifies how novices may learn to make sound decisions in uncertain situations. The model places these arguments within a coherent sequence: institutional expectations create conditions for dialogue; dialogue surfaces ethical complexity; reflection supports judgement; and authentic practice tests the reasoning in action.

Several tensions require explicit safeguards. First, respect for cultural difference cannot justify discrimination or the violation of children's rights; pedagogical decision-making must be consistent with equal dignity and inclusion [2, 12]. Second, ethics assessment should not become surveillance of private beliefs. Universities can legitimately assess professional actions and articulated reasoning while remaining cautious about claims to measure inner virtue. Third, reflective exercises may become merely performative when students learn to repeat the language preferred by an evaluator. Credible assessment therefore requires open-ended scenarios, opportunities to disagree respectfully and attention to the correspondence between a written justification and conduct during practice.

For preschool teacher preparation, the model provides a useful design orientation because relationships with families, colleagues and young children are inseparable from educational content. Illustrative tasks may include responding to a parent's concern about unequal participation, explaining an inclusive classroom routine in accessible language, and balancing family preferences with an individual child's well-being. Such scenarios should be adapted collaboratively with local educators rather than imported without modification. UNESCO's new social contract for education [11] and its 2023 Recommendation [12] support the ethical orientation toward care, participation and cultural diversity, while leaving specific curriculum decisions to responsible educational institutions.

CONCLUSION

Developing ethical and cultural relations among prospective teachers requires more than explicit instruction about acceptable behaviour. The interpretive synthesis presented here identifies four complementary pedagogical conditions: normative coherence across the learning environment, inclusive dialogue, mentored critical reflection and authentic school–community engagement. Corresponding methods—ethical case analysis, perspective-sensitive role-play, structured reflection and supervised practicum tasks—translate these conditions into learning experiences. A formative set of indicators connects ethical recognition, respectful communication, justified reflection and responsible enactment with observable educational evidence.

The framework offers a theoretically informed basis for refining teacher-education curricula, including preschool teacher preparation in Uzbekistan. Its limitations are equally important: no participant data were collected, no intervention was tested and no improvement percentages or causal effects are claimed. The next research stage should adapt the proposed tasks to a defined curriculum, obtain the necessary permissions, develop reliable rubrics and evaluate the model with transparent empirical procedures. These steps would determine whether the suggested integration actually improves the quality of prospective teachers' ethical and cultural professional relations.

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DEVELOPING ADAPTIVE COMPETENCIES OF PRE-SERVICE PRESCHOOL TEACHERS IN CHANGING EDUCATIONAL ENVIRONMENTS: MODEL DESIGN AND EXPERIMENTAL EVALUATION

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Abstract. *The article examines a pedagogical model intended to support the adaptation of pre-service preschool teachers to changing educational environments and summarizes the reported results of its implementation. The study aims to explain how diagnostic, content-related, activity-oriented and evaluation components interact and to compare changes in experimental and control groups. Aggregate data from the author's 2022–2026 study cover 456 students enrolled in preschool education programmes at pedagogical institutes in Bukhara, Termez and Andijan, including 226 students in the experimental group and 230 in the control group. Descriptive comparisons of intellectual engagement, communication skills and adaptability show a larger increase in the proportion of high-level outcomes in the experimental group. The findings suggest that an integrated support model may be relevant to teacher education practice. However, the absence of participant-level data prevents independent significance testing and does not support strong causal claims.*

Keywords: *changing educational environment, adaptive competencies, pre-service preschool teachers, pedagogical model, academic adjustment, tutoring, diagnostics, pedagogical experiment.*

INTRODUCTION

Teacher education programmes are undergoing continuous changes in curricula, learning resources and modes of communication. Alongside conventional classroom instruction, distance and blended learning, digitally mediated assignments, independent study and practice-based activities increasingly require students to navigate several learning conditions simultaneously. For pre-service preschool teachers, this challenge is particularly consequential: they must manage their own university learning, develop age-appropriate communication practices for working with children, collaborate effectively and make pedagogically sound decisions in unfamiliar situations during teaching practice. Adaptability should therefore be understood not simply as passive adjustment to a new academic routine but as an integrative competence through which students actively align their personal capacities with the demands of a changing educational environment.

The OECD Learning Compass 2030 emphasizes student agency and the integrated use of knowledge, skills, attitudes and values [1]. UNESCO's 2023 report on technology in education likewise argues that digital tools should support rather than replace meaningful interaction between teachers and learners [2]. Together, these perspectives indicate that adjustment to an evolving learning environment cannot be reduced to technical readiness or digital literacy alone. Academic,

social, communicative, motivational and reflective dimensions of adaptation should be considered within a coherent pedagogical framework.

The central problem addressed in this study is that support mechanisms in higher education —diagnostic assessment, tutoring, mentoring, differentiated assignments and digital monitoring— may exist as separate practices without being integrated into a developmental pathway responsive to individual student needs. As a result, emerging adjustment difficulties may remain undetected, and there may be a disconnect between identifying needs, providing targeted assistance and monitoring its outcomes. This article aims to articulate a pedagogical model for developing adaptive competencies among pre-service preschool teachers and to describe the changes observed in the experimental and comparison groups using the author's reported educational experiment data.

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

In research on academic adjustment, the relationship between a student's individual preparedness and the institutional environment is a central explanatory issue. Tinto related academic and social integration within an institution to student persistence [3]. Kahu and Nelson conceptualized student engagement as a dynamic process occurring at the 'educational interface', where personal characteristics and educational conditions intersect [4]. These approaches provide a theoretical rationale for moving beyond uniform orientation programmes and instead attending to the particular learning needs and social experiences of pre-service teachers.

Zimmerman's account of self-regulated learning identifies goal setting, planning, monitoring and reflection as central processes of independent learning [5]. Nicol and Macfarlane-Dick likewise explain how feedback can function not merely as an assessment delivered by an instructor but as a resource students use to evaluate their progress and determine subsequent action [6]. An individual learning trajectory, therefore, should not be treated as a rigid plan established in advance; it is better understood as a pedagogical mechanism that is continually adjusted through assessment, support and reassessment.

According to self-determination theory developed by Deci and Ryan, the needs for autonomy, competence and relatedness are key conditions for sustained motivation [7]. The systematic review by Richardson, Abraham and Bond discusses psychological correlates of academic performance in higher education [8]. Means, Bakia and Murphy further stress that the value of online learning depends not on technology in isolation but on how it is implemented in a particular learning context and for particular learners [9]. These perspectives suggest that teaching technologies, reflective regulation and psychosocial support cannot be adequately considered as unrelated elements of adaptive competence development.

In the relevant Uzbek-language literature, the conceptual clarification of adaptation and the classification of educational support mechanisms have received attention. The author's earlier publications examined adequate adjustment to changing educational environments as a pedagogical problem [10] and discussed the composition of adaptation mechanisms [11]. Rather than restating those theoretical arguments, the present article extends the discussion by examining the interconnected components of a functional model and calculating between-group changes from the available aggregate experimental data.

In this study, adaptive competence is defined as an integrative capacity to interpret changing academic demands, reorganize learning activity, communicate constructively and respond appropriately to unfamiliar situations. In accordance with this definition, the empirical evaluation draws on three indicators: intellectual engagement, communication skills and

adaptability. Although these indicators do not exhaust the broader construct of adaptive competence, they represent observable dimensions of particular relevance to pedagogical practice.

MATERIALS AND METHODS

The empirical basis consists of educational experiment materials collected by the author between 2022 and 2026 among students enrolled in the 60110200 Preschool Education programme at pedagogical institutes in Bukhara, Termez and Andijan. The overall sample comprised 456 students: 226 in the experimental group and 230 in the comparison (control) group. For the present article, the baseline and final aggregate tables reported in the dissertation abstract were re-examined. Details of random allocation, individual assessment sheets and the complete raw dataset were not available for the current analysis; the study design is therefore described cautiously as a comparative, quasi-experimental approach rather than a randomized experiment.

The original project proceeded through three stages. During the diagnostic stage (2022–2023), the existing state of student adjustment, learning needs and relevant pedagogical conditions were examined. During the formative stage (2023–2024), the functional model was developed and introduced into coursework and teaching practice. The concluding assessment stage (2025–2026) involved renewed assessment of students' adaptation levels. The wider study used observation, interviews, questionnaires, expert appraisal and educational experimentation. Its description also refers to the Rogers–Diamond measure of socio-psychological adjustment, Rokeach's value orientations and Torrance's approach to creative thinking; however, the aggregate tables available for this article do not permit separate calculation of scores from those instruments.

The refined pedagogical model comprises four interrelated components. The goal-setting component specifies purposeful preparation for change. The content component connects learner-centredness, individuality, humanistic orientation, differentiation across levels and active adjustment with competence-based and systems approaches. The activity-oriented component integrates individualized assignments, small-group learning, tutoring, mentoring, peer interaction and digital monitoring across diagnostic, developmental and evaluative stages. The outcome assessment component tracks intellectual engagement, communication skills and adaptability using three reported performance categories: high, medium and low.

The repertoire of educational methods described by the author includes 'Cooperative Opportunity' (Kooperativ imkon), shadowing, 'budding', competence-focused tasks, case studies, graphic organizers and empathy mapping. These activities are intended to align learning opportunities with students' pace of understanding and communicative capacities. In the Cooperative Opportunity approach, group members distribute responsibilities, justify their decisions to peers and reconsider solutions through discussion. Shadowing involves observing the work of an experienced educator, learning from professional practice and reflecting on the observed interactions. The outcomes reported here refer to the broader programme in which methods were implemented together; they cannot establish the independent effect of any one technique.

For the quantitative component, group sizes and the absolute frequencies reported for high, medium and low levels across the three outcomes were used. Within-group proportions were calculated as $n/N \times 100$. Changes from baseline to final assessment were expressed in percentage points, and the difference between the experimental-group and control-group changes was also calculated descriptively. These calculations are not equivalent to hypothesis testing, causal effect estimation or longitudinal analysis of individual students.

RESULTS

At baseline, the distributions across high, medium and low levels were broadly comparable in the two groups. For intellectual engagement, the high category included 69 students (30.5%) in the experimental group and 71 (30.9%) in the control group. The corresponding figures for communication skills were 68 (30.1%) and 70 (30.4%); for adaptability, they were 72 (31.9%) and 74 (32.2%). The similarity of these initial proportions supports a descriptive comparison, although it does not establish equivalence between groups on every potentially relevant characteristic.

Table 1. Proportion of students assessed at the high level in the experimental and control groups

Assessment indicator	EG at baseline	EG at final assessment	CG at baseline	CG at final assessment
Intellectual engagement	69 (30.5%)	94 (41.6%)	71 (30.9%)	75 (32.6%)
Communication skills	68 (30.1%)	96 (42.5%)	70 (30.4%)	73 (31.7%)
Adaptability	72 (31.9%)	95 (42.0%)	74 (32.2%)	77 (33.5%)

Note. EG = experimental group (n = 226); CG = control group (n = 230). Percentages in parentheses were recalculated from the reported counts and the respective group totals. Source: aggregate tables from the author's educational experiment.

At the final assessment, the number of experimental-group students rated at the high level reached 94 for intellectual engagement, 96 for communication skills and 95 for adaptability. The corresponding counts in the control group were 75, 73 and 77. Between baseline and the final assessment, the share of high-level outcomes in the experimental group increased by 11.1 percentage points in intellectual engagement, 12.4 points in communication skills and 10.2 points in adaptability. The respective increases in the control group were approximately 1.7, 1.3 and 1.3 percentage points. Accordingly, the descriptive difference in changes between the groups amounted to 9.3, 11.1 and 8.9 percentage points across the three indicators.

Table 2. Descriptive comparison of changes in high-level outcomes

Assessment indicator	Change in EG, pp	Change in CG, pp	Difference, pp
Intellectual engagement	+11.1	+1.7	+9.3
Communication skills	+12.4	+1.3	+11.1
Adaptability	+10.2	+1.3	+8.9

Note. pp = percentage points. Estimates were calculated from absolute counts and rounded; displayed subtraction may differ by 0.1 pp owing to rounding.

The reduction in the number of students rated at the low level is also noteworthy. In the experimental group, low-level outcomes fell from 82 to 35 students in intellectual engagement, from 82 to 31 in communication skills and from 80 to 30 in adaptability. The corresponding decreases were smaller in the control group: from 82 to 77, 85 to 77, and 81 to 71, respectively. These distributions indicate a shift toward the medium and high categories under the conditions in which the programme was implemented. However, aggregate tables do not show which individual students moved between specific categories. Consequently, they do not support a quantitative reconstruction of individual developmental pathways.

DISCUSSION

The shifts observed in the experimental group are conceptually consistent with the model's theoretical rationale. Diagnostic assessment may help identify individual needs, while targeted support and activity-based approaches may encourage students to take greater initiative in learning tasks. The work of Zimmerman and of Nicol and Macfarlane-Dick [5; 6] offers an explanatory framework grounded in self-regulation and feedback. Within a staged monitoring process, students are expected not merely to receive an assessment but also to reflect on their performance and revise subsequent learning goals.

Tutors and mentors fulfil complementary functions in supporting adaptation. Tutors can coordinate learning tasks, guide students toward academic resources and recognize difficulties at an early stage. Mentors can provide experience-based guidance when discussing professional situations, emerging teacher identity and practical decisions. For pre-service preschool teachers, this combination may help connect university coursework with field practice. Nevertheless, the currently available materials do not enable the independent effects of tutoring or mentoring to be quantified. Accordingly, both are considered integrated components of the overall model rather than independently validated interventions.

The rise in high-level communication skills was more pronounced than the changes observed for the other indicators. This pattern is compatible with the pedagogical rationale of small-group responsibility sharing, explaining ideas to peers and collaboratively analysing problematic situations. Collaborative learning, however, requires more than visible participation: students also need to substantiate their views, engage with competing interpretations and discuss disagreement constructively. Kahu and Nelson's account of the interaction between student engagement and the educational environment [4] is especially relevant in this respect. Digital tools can facilitate collaboration and observation across locations, but their educational contribution remains dependent on alignment with direct communication and instructional purposes [2; 9].

Three methodological limitations are particularly important when interpreting these findings. First, the available information consists of aggregate categorical outcomes; individual change, measurement consistency and the psychometric properties of assessment instruments cannot be independently examined. Second, the documentation available for the present analysis does not fully specify group assignment procedures, differences between instructors and groups, or fidelity to the intervention. Third, differences expressed in percentage points are descriptive estimates and do not, by themselves, demonstrate statistical significance or establish that changes were caused by particular model components. Future work should document measurement quality, preserve appropriately anonymized participant-level data, assess intervention fidelity and apply inferential procedures suited to the study design.

For educational practice, the model suggests initial diagnostics at the beginning of a semester, individualized learning pathways for students requiring additional support, closer alignment of activity-based methods with teaching practice, and periodic brief cycles of reflective monitoring. These are presented as pedagogical recommendations arising from the theoretical literature and the observed descriptive patterns, not as interventions whose distinct causal effects have already been demonstrated by the available data.

CONCLUSION

Preparing pre-service preschool teachers for changing educational environments requires more than a one-off orientation activity. It calls for an integrated approach linking assessment, personalized learning, collaborative communication, reflective self-management and the

evaluation of outcomes. The four-component model considered in this article provides a methodological structure for coordinating these processes. Its distinctive feature is the proposed functional relationship among individualized learning pathways, tutoring and mentoring, cooperative learning methods and digital monitoring.

Descriptive analysis of aggregate outcomes from 456 participants showed larger increases in the share of high-level intellectual engagement, communication skills and adaptability in the experimental group than in the control group. Between-group differences in these increases ranged from approximately 8.9 to 11.1 percentage points. These results warrant further examination of the model in educational practice but should not be interpreted as definitive proof of a causal intervention effect. Subsequent research should assess statistical uncertainty using participant-level data, document implementation fidelity and evaluate the validity and reliability of the outcome measures.

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SEQUENCE WITHOUT EVIDENCE OF SEQUENCE: A CRITICAL EVIDENCE-TRANSFER APPRAISAL OF STAGED PSYCHOSOCIAL SUPPORT FOR YOUNG PEOPLE WHO USE DRUGS

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Abstract. *Staged models of psychosocial support for young people who use drugs are widely proposed, yet the evidence offered for them is seldom examined for transferability. This conceptual, secondary-evidence study takes a recent Uzbek theoretical article as its point of departure and asks whether the research it invokes justifies a linear pathway from assessment to relapse prevention. Fourteen sources were appraised against four transfer dimensions: population fit, comparator and outcome, durability, and contextual fit. The appraisal shows that adolescent-specific evidence exists for brief motivational interventions, cognitive behavioral therapy, and family therapy, but effects are small to moderate, depend on the comparison condition, and weaken at longer follow-up. No reviewed source evaluates a fixed stage order, and none derives from Uzbekistan. The study argues that relapse prevention and follow-up are better treated as recurrent structural features than as a terminal stage, and it offers a time-aligned figure and two testable propositions. The conclusions are interpretive, rest on single-coder judgment, and require empirical testing.*

Keywords: *adolescent substance use, psychosocial intervention, relapse, evidence transfer, continuing care, Uzbekistan.*

Introduction

Psychosocial support for young people who use drugs is usually described as a sequence. A person is assessed, motivated, treated, supported by family and community, rehabilitated, and finally protected against relapse. A recent Uzbek-language article (“Giyohvand Moddalar,” n.d., hereafter the source article) states this logic with unusual clarity: initial evaluation leads to needs identification, then to motivation building, psychological intervention, family and social support, rehabilitation, and, last, relapse prevention with long-term follow-up. Its authors add, sensibly, that the order is not rigid.

That qualification deserves more weight than it receives. A sequence is not merely a description; it carries an implicit causal claim that earlier stages are conditions for later ones and that the process has an end. Whether the cited research supports such a claim is an empirical question, and the source article, which is explicitly theoretical and presents its evaluation criteria as indicators rather than findings, does not set out to answer it. The question matters beyond one article: as Zakhidova et al. (2025) note, data on the consequences of new psychoactive substance use in Central Asia remain scarce, and models adopted now will shape what is measured later.

This paper therefore asks: To what extent does the evidence invoked for youth psychosocial support justify a linear staged pathway, and what architecture does that evidence better support? The central thesis is that the evidence supports components more securely than it

supports their order. It is more consistent with a recursive design in which reassessment and re-engagement recur across time than with a pathway that ends in follow-up, and its portability to Uzbekistan is an untested assumption rather than an established fact.

The contribution is deliberately modest. It offers (a) an explicit appraisal of how far each component's evidence transfers to the population and setting the source article addresses, (b) a reading of relapse as structural rather than terminal, grounded in existing models, and (c) a time-aligned figure from which two testable propositions follow.

Literature Review

What the Evidence Establishes

Several findings are reasonably secure. Brief alcohol interventions for adolescents aged 11 to 18 produce modest reductions in consumption ($g = 0.27$) and alcohol-related problems ($g = 0.19$), effects that persisted for up to one year; motivational interviewing and components such as decisional balance and goal setting were associated with larger effects (Tanner-Smith & Lipsey, 2015). Reviews of outpatient behavioral treatment for adolescent substance use have classified individual and group cognitive behavioral therapy (CBT) and ecological family-based treatment as well established, and motivational interviewing and behavioral family-based treatment as probably efficacious (Hogue et al., 2018). A meta-analysis of four family-therapy models for adolescent delinquency and substance abuse found statistically significant but modest advantages over treatment as usual ($d = 0.21$, $k = 11$) and over alternative therapies ($d = 0.26$, $k = 11$) (Baldwin et al., 2012).

The same literature qualifies these results. In a meta-analysis of 30 randomized trials of CBT for alcohol or other drug use disorders, CBT outperformed minimal treatment, but advantages over nonspecific therapy or treatment as usual held at early follow-up (1 to 6 months) and not at late follow-up (8 months or more), and CBT did not outperform another specific therapy (Magill et al., 2019). A subsequent evaluation applying clinical-psychology criteria for empirically supported treatments reached a strong recommendation for CBT but rated the evidence as moderate in quality, relied on a single adequately rigorous meta-analysis, and described effects as small to moderate and diminishing over time (Boness et al., 2023). Contingency management, endorsed for adolescents in the UNODC–WHO statement (Volkow et al., 2024), has a favorable systematic review for methamphetamine use disorder, with abstinence benefits in 20 of 21 studies reporting that outcome (Brown & DeFulio, 2020).

Policy Consensus and Its Limits

The international standards that the source article relies on call for person-centered, evidence-based, ethically grounded, and continuous services (World Health Organization [WHO] & United Nations Office on Drugs and Crime [UNODC], 2020). The 2024 statement of the UNODC–WHO Informal Scientific Network, published in World Psychiatry, recommends a continuum from screening and brief interventions to family therapy, contingency management, and CBT, insists that adolescents be assured of care without discrimination, and asks states to build age- and gender-disaggregated data systems so that effectiveness can be evaluated (Volkow et al., 2024). Notably, it calls for a continuum, not a sequence. A continuum specifies what must be available; it does not specify what must come first.

Relapse, Chronicity, and Time

A parallel literature questions treating relapse as an endpoint. Witkiewitz and Marlatt (2004) reconceptualized the cognitive-behavioral model of relapse around dynamic interactions between multiple risk factors and situational determinants, which implies that vulnerability

fluctuates and cannot be neutralized once, at the close of treatment. Dennis and Scott (2007) approached addiction as a chronic condition and described recovery management checkups in which staff conduct quarterly status assessments, use motivational interviewing with those who have relapsed, and actively link people back to care. In the trials they summarize, checkup participants re-entered treatment sooner (median 376 versus 600 days) and were less likely to need treatment after two years (34% versus 44%). Scott et al. (2005), studying 448 patients, examined transitions among relapse, treatment re-entry, incarceration, and recovery, a description of movement that a linear pathway cannot easily accommodate.

The Biopsychosocial Frame

The source article grounds its analysis in a biopsychosocial approach, as does the UNODC–WHO statement's call for research on biopsychosocial risk and protective factors. Engel (1977) proposed that model as a blueprint for research and action and left its usefulness as an open question. The frame licenses multi-level assessment, but by itself it says nothing about temporal ordering, and invoking it should not be mistaken for evidence about sequence.

Method

The study uses a conceptual, critical, secondary-evidence design. No participants were recruited and no data were collected. The analytic object is the evidential warrant for a specific claim: that psychosocial support for young people who use drugs should follow a staged order ending in relapse prevention and follow-up.

Sources were assembled in two steps. First, the bibliography of the source article was examined. Of its eight entries, the three studies on CBT (Boness et al., 2023), contingency management (Brown & DeFulio, 2020), and family therapy (Baldwin et al., 2012) are not cited in the article's body text, so their role in its argument is implied rather than stated. Second, targeted searches identified additional reviews and primary statements on adolescent brief interventions, adolescent treatment evidence, relapse theory, and continuing care. This was purposive, not a systematic search, and the selection reflects my judgment of relevance. Bibliographic metadata and DOIs for the fourteen listed references were checked against publisher, PubMed, or PsycNET records. Two of the source article's entries by Mamajonova (2023, 2024), on adolescent addictive behavior in Uzbekistan, could not be verified in the searches conducted and are therefore discussed only as reported by the source article, not listed as references. The UNODC–WHO statement is attributed in the source article to Addiction; the record located here is a World Psychiatry statement (Volkow et al., 2024), and the latter is cited.

Each intervention component was appraised on four transfer dimensions. Population fit asks whether the reviewed samples were adolescents. Comparator and outcome asks what the intervention was compared with and what was measured. Durability asks whether effects were examined beyond post-treatment. Contextual fit asks whether any evidence comes from Uzbekistan or Central Asia. Judgments were made by one coder, without a reliability check, and are reported as Direct, Partial, or Absent only where the cited abstracts or full texts permitted. Effect sizes are reported as published; standardized mean differences from different reviews (d and g) are not interchangeable and are never pooled here.

Analysis

Components Are Supported More Firmly Than Their Order

Table 1 summarizes the appraisal. Three components have adolescent-specific support: brief and motivational interventions, CBT, and family-based therapy. For each, however, the quality of the inference narrows once the other dimensions are examined. The motivational

evidence comes largely from brief alcohol interventions, from studies of participants who were not seeking treatment (Tanner-Smith & Lipsey, 2015); the source article invokes motivational interviewing for young people who use illicit drugs. That is a plausible extension, not a demonstrated one.

Table 1

Evidence-Transfer Appraisal of Intervention Components Named in the Source Article

Component	Key sources	Adolescent fit	Durability	Uzbek or Central Asian evidence	Source article's treatment
Motivational and brief interventions	Tanner-Smith & Lipsey (2015); Hogue et al. (2018)	Direct (ages 11–18), but alcohol-focused	Up to 1 year for brief alcohol interventions	Absent	Described; no effect estimate cited
Cognitive behavioral therapy	Hogue et al. (2018); Magill et al. (2019); Boness et al. (2023)	Direct via Hogue et al.; Boness et al. restricted to adults	Advantage weaker at 8+ months	Absent	Described; Boness et al. listed but not cited in text
Family-based therapy	Baldwin et al. (2012); Hogue et al. (2018)	Direct (adolescent delinquency and substance abuse)	Post-treatment effects only	Absent	Described; Baldwin et al. listed but not cited in text
Contingency management	Brown & DeFulio (2020); Volkow et al. (2024)	Partial (methamphetamine review); recommended for adolescents in statement	Not appraised here	Absent	Not discussed in text; Brown & DeFulio listed
Reassessment and continuing care	Dennis & Scott (2007); Scott et al. (2005); Witkiewitz & Marlatt (2004)	Not established (trial samples not verified)	Two-year re-entry and need outcomes	Absent	Final stage; no schedule or trigger specified

Note. Coding reflects the author's single-coder judgment from abstracts and available full texts; "Absent" means no evidence was identified in the sources examined, not that none exists. Effect-

size metrics differ across reviews and are not pooled. Source article refers to “Giyohvand Moddalar” (n.d.).

The CBT case is instructive because it is the one the source article’s own bibliography best illustrates. The Boness et al. (2023) evaluation, drawn on adult literature, supports a strong recommendation; adolescent support for CBT rests on a separate line of reviews (Hogue et al., 2018). Citing the former for a youth model would overstate transfer; adolescent CBT is well supported as a component, but the magnitude of benefit, its decay, and its interaction with other components remain poorly specified.

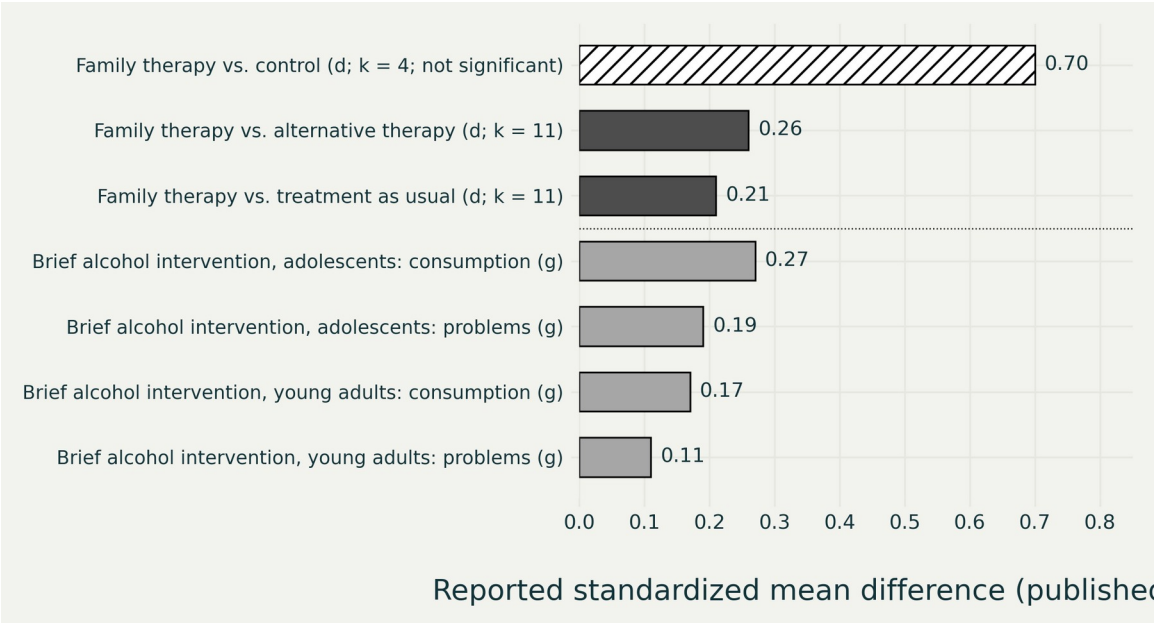
The most consequential gap lies in the final column of Table 1. No reviewed study tests whether delivering components in the order assessment, motivation, therapy, family support, rehabilitation, relapse prevention produces better outcomes than delivering them concurrently or in adaptive order. The multicomponent treatments classified as well established or probably efficacious by Hogue et al. (2018) combine approaches within one program, which, if anything, suggests integration rather than strict succession. I do not claim that sequence is wrong. I claim that it is an unexamined design choice presented with the authority of the components it contains.

Effects Are Small, Contingent, and Time-Limited

Figure 1 plots the effect sizes reported in the two youth-focused meta-analyses discussed above. Three features are visible. The magnitudes cluster between roughly 0.1 and 0.3 standard deviations; the largest value (d = 0.70, family therapy against a control condition) rests on four comparisons and was not statistically significant; and the values depend on what the intervention is compared with, since the family-therapy effect grows as the comparator weakens. The figure does not rank interventions, because outcomes, samples, and metrics differ; it shows that the evidence consists of modest, comparator-sensitive effects, the profile one would expect if benefits require maintenance.

Figure 1

Reported Effect Sizes in Two Meta-Analyses of Youth Interventions



Note. Bars show standardized mean differences exactly as published: Cohen’s d for family therapies (dark bars) and Hedges’s g for brief alcohol interventions (gray bars). Comparators and outcomes differ across bars, and d and g are not interchangeable. The hatched bar was not

statistically significant. Data re-plotted by the author from Baldwin et al. (2012) and Tanner-Smith and Lipsey (2015).

Durability reinforces that reading. Magill et al. (2019) and Boness et al. (2023) report that CBT's advantage over comparison conditions is larger at 1 to 6 months than at 8 months or more. Baldwin et al. (2012) evaluated post-treatment effects only. Tanner-Smith and Lipsey (2015) document persistence up to one year for brief interventions, which is encouraging but concerns a different intervention class. If benefits decay and risk fluctuates (Witkiewitz & Marlatt, 2004), the period after active treatment is not an epilogue. It is where much of the outcome is determined.

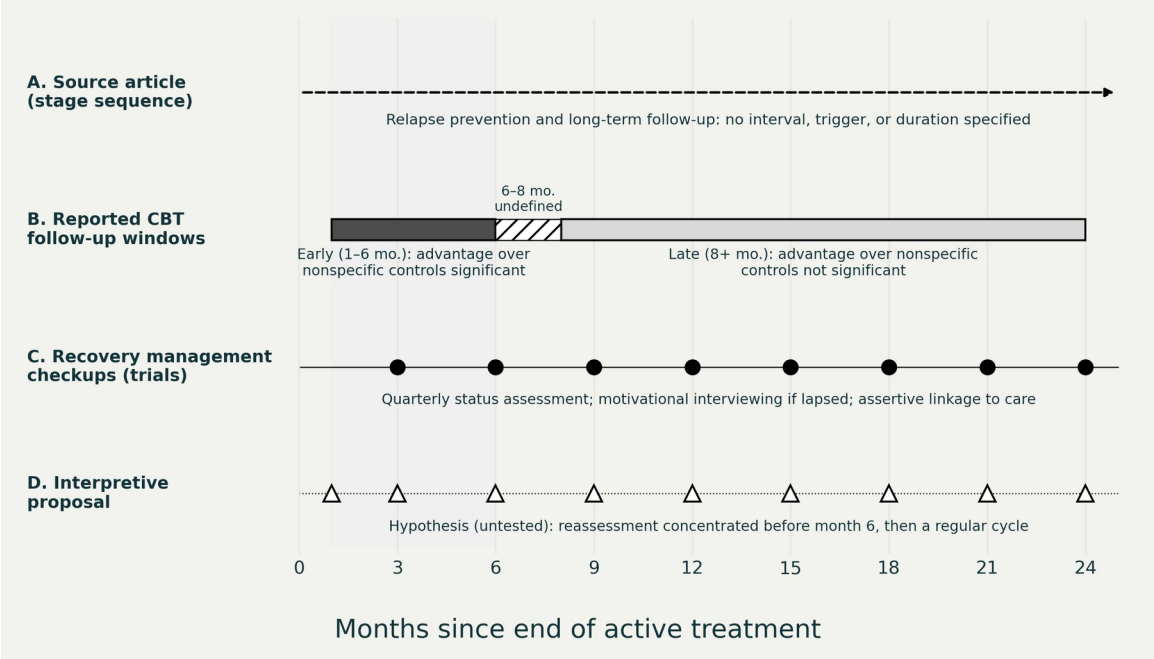
Relapse as Structure, Not Stage

The source article makes an important and correct point when it insists that a return to use should prompt revision of the support plan rather than a verdict on willpower. The implication, however, is structural. If relapse indicates a need to reassess, then reassessment must be built into the system at intervals, not located at the end of a pathway that a young person may already have left. Recovery management checkups operationalize exactly this by assessing status quarterly rather than waiting for the patient to recognize a need for help (Dennis & Scott, 2007), and the movement among relapse, re-entry, and recovery described by Scott et al. (2005) shows trajectories that loop.

Figure 2 aligns three things on one time axis: the source article's final stage, which specifies no interval; the early and late follow-up windows used in the CBT meta-analysis; and the quarterly checkup schedule. The figure makes visible a mismatch that prose obscures. The window in which CBT's advantage is demonstrated closes at about the second quarterly checkup, whereas the source article's follow-up has no schedule at all. The dashed row is my interpretive proposal, not an evidence-based schedule: reassessment concentrated early, when effects are largest and ambivalence is likely to be live, then settling into a regular cycle. I place Figure 2 here because it integrates three literatures the reader has by now met separately.

Figure 2

Temporal Alignment of a Sequence-Based Model, Reported Follow-Up Windows, and Checkup Schedules



Note. Lanes A and D are interpretive; lanes B and C reproduce published descriptions. Early (1–6 months) and late (8+ months) windows follow Magill et al. (2019) as reported by Boness et al. (2023). Quarterly checkups follow the recovery management checkup model described by Dennis and Scott (2007). Original conceptual figure by the author; not an empirical dataset.

What this establishes should be stated carefully. The early and late windows are definitions from a meta-analysis of CBT, not clinical thresholds, and the checkup trials were not designed around them. The figure is therefore an alignment device that exposes where a linear model is silent, not a demonstration that quarterly checkups are optimal for young people in Uzbekistan. Two propositions follow as testable hypotheses. Proposition 1: structured reassessment within the first six months after active treatment reduces the interval between lapse and re-engagement relative to unscheduled follow-up. Proposition 2: the effect of any single component on outcomes at eight months or more depends on whether reassessment occurred, so that effects measured at post-treatment overestimate longer-term benefit in services without scheduled follow-up.

Measurement Without Instruments

The source article rightly argues that abstinence or frequency of use is too narrow a yardstick and proposes seven criteria: participation and retention, motivation for change, emotional stabilization, skills for managing risk, family and social relationships, return to education or work, and strategies against relapse. The UNODC–WHO statement's request for disaggregated data systems points in the same direction (Volkow et al., 2024). Yet an uncomfortable asymmetry appears. The evidence in the reviews examined here is concentrated on substance use outcomes, and Boness et al. (2023) found that evidence for CBT's effects on psychosocial and functional outcomes came from a dated study of critically low quality. The outcomes the source article values most are those least well documented.

This is not an argument against broad criteria, but they presently function as aspirations without instruments, time points, or thresholds. The Zakhidova et al. (2025) protocol, which will interview people aged 18 to 35 about motives, risk perception, stigma, help-seeking barriers, and service needs, is a promising source of such grounding. Its population, though, is young adults, whereas the UNODC–WHO statement defines adolescence as ages 10 to 19; an age-band gap therefore separates the only Uzbek-specific design identified here from much of the adolescent evidence appraised in this paper.

Discussion

The analysis does not overturn the source article's practical recommendations. Motivational, cognitive-behavioral, and family-based components are supported for adolescents, coordination across sectors is consistent with the international consensus, and the emphasis on dignity and confidentiality fits the UNODC–WHO guidance. What changes is the status of the pathway. As presented, it is a coherent clinical heuristic; as a claim about how services should be ordered, it lacks direct evidence, and the evidence adjacent to it points toward iteration.

Two theoretical implications follow. First, the biopsychosocial frame needs a temporal axis. Engel's (1977) model organizes levels of explanation, and Witkiewitz and Marlatt's (2004) dynamic account supplies time dependence; combined, they imply that risk and protection should be reassessed repeatedly, not once. Second, evidence-based practice in settings with little local research should distinguish between exporting components and exporting configurations. Components carry effect estimates, even if modest, from external trials; configurations such as stage order carry only the authority of consensus until they are tested.

For Uzbekistan, the practical corollary is neither to delay services until local trials exist nor to adopt a foreign design wholesale, but to build services whose operation generates the missing data, for example by recording assessment, re-engagement, and follow-up contacts in a form that permits the comparisons proposed above.

Limitations

Several limitations constrain these conclusions. The source set is small, purposively assembled, and appraised by a single coder; a systematic search with independent screening would test whether the apparent absence of sequence-comparison trials survives a broader net. Several quantitative statements rest on abstracts and secondary descriptions, not full-text extraction, and the effect sizes in Figure 1 come from different metrics, populations, and comparators, so they illustrate magnitude and sensitivity rather than permitting comparison. The checkup trials were summarized through a review and I could not establish whether their samples included adolescents; applying them to youth is an assumption, as is applying adult CBT reviews. The two Mamajonova studies could not be verified, so the appraisal may understate locally produced evidence. Finally, the proposed schedule is a hypothesis, and ethical and legal safeguards for minors, including confidentiality limits, lie beyond a conceptual analysis.

Conclusion

The evidence that the source article's bibliography and its neighboring literature offer is better at justifying what to provide than in what order to provide it. Brief motivational, cognitive-behavioral, and family-based interventions have adolescent-specific support, but their effects are modest, depend on the comparator, and, where examined, weaken with time. No reviewed source tests stage order, and none originates in Uzbekistan. Read together, the findings favor treating reassessment and re-engagement as recurrent features of service design, with relapse prevention woven through support rather than appended to it.

The claim is bounded. It rests on a small, judgment-based appraisal and offers hypotheses rather than results. Its value lies in specifying what a staged model assumes and where those assumptions are untested. The next step is empirical: prospective service data from Uzbekistan, collected with defined time points and instruments, would show whether the pathway, the cycle, or something else describes what young people actually experience.

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DIFFERENTIATED INSTRUCTION IN MIXED-ABILITY GROUPS AS A MEANS OF DEVELOPING PROFESSIONAL COMMUNICATIVE COMPETENCES OF NON-PHILOLOGY STUDENTS

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Abstract. *The article addresses one of the most pressing problems of foreign language teaching in non-philological fields of study – the considerable differences in students' language proficiency within one group – and examines differentiated instruction as a means of developing students' professional communicative competences in such conditions. The theoretical foundations of differentiation are analysed, including L.S. Vygotsky's concept of the zone of proximal development, I.E. Unt's theory of individualisation and differentiation of learning, C.A. Tomlinson's model of differentiated instruction and research on teaching large multilevel classes by P. Ur and N. Hess. The article critically discusses the concept of learning styles and argues that differentiation should be based primarily on learners' readiness, interests and professional needs. Four areas of differentiation in professionally oriented foreign language teaching – content, process, product and learning environment – are described with examples. Practical techniques are proposed, including tiered tasks, flexible grouping, open-ended communicative tasks, graded language support and choice of tasks, and the role of cooperative learning in mixed-ability groups is substantiated. It is argued that differentiated instruction allows all students, regardless of their initial level, to progress in developing their professional communicative competences.*

Keywords: *differentiated instruction, mixed-ability groups, multilevel classes, tiered tasks, flexible grouping, zone of proximal development, cooperative learning, professional communicative competence, non-philology students, ESP*

Introduction. The importance of foreign language proficiency for specialists in all fields is emphasised in the state policy of the Republic of Uzbekistan. The Presidential Resolution "On measures to bring the activities to popularise the learning of foreign languages to a qualitatively new level" sets the task of improving the quality of foreign language teaching at all levels of education, including higher education [1]. In non-philological fields of study, however, the achievement of this goal is complicated by a number of factors, one of the most significant being the considerable differences in students' language proficiency within the same group.

Students entering non-philological programmes come from different schools, regions and educational backgrounds. In one group, there may be students who already have an intermediate or upper-intermediate level of English and students who are still at an elementary level. In such conditions, teaching aimed at the "average" student is ineffective: tasks that are appropriate for some students are too difficult for others and too easy for the rest. As a result, weaker students lose confidence and motivation, while stronger students lose interest. This problem is particularly acute in developing professional communicative competence, which requires students to participate actively in complex communicative tasks.

The aim of this article is to examine differentiated instruction as a means of developing the professional communicative competences of non-philology students in mixed-ability groups, to analyse its theoretical foundations and to propose practical techniques for its implementation.

Theoretical foundations of differentiation. The psychological basis for differentiated instruction is provided by L.S. Vygotsky's concept of the zone of proximal development [2]. According to Vygotsky, effective learning takes place when tasks are slightly beyond what the learner can do independently but can be accomplished with appropriate support. Since students in a mixed-ability group have different zones of proximal development, a single task cannot be optimal for all of them. Differentiation makes it possible to adjust tasks and support so that each student works within his or her own zone of proximal development.

In Soviet and post-Soviet pedagogy, the problem of differentiation was studied in detail by I.E. Unt [3], who distinguished between individualisation, that is, taking into account individual characteristics of learners in all forms of teaching, and differentiation, that is, grouping learners according to certain characteristics for separate instruction. She emphasised that differentiation can be external, when learners are placed in different groups or streams, and internal, when different approaches are used within the same class. In higher education, internal differentiation is often the only realistic option, since groups are formed according to the field of study rather than language proficiency.

In Western pedagogy, the most influential model of differentiated instruction was developed by C.A. Tomlinson [4; 5]. She defines differentiation as a teacher's proactive response to learners' needs, guided by general principles such as respectful tasks, flexible grouping and ongoing assessment. According to Tomlinson, teachers can differentiate content (what students learn and the materials they use), process (how students make sense of content), product (how students demonstrate what they have learned) and learning environment (the conditions in which learning takes place) according to students' readiness, interests and learning profiles.

In foreign language teaching, the problem of mixed-ability groups has been addressed by P. Ur and N. Hess. P. Ur [6] considers heterogeneous classes one of the most difficult challenges for language teachers and recommends a combination of techniques: individualisation, open-ended tasks, compulsory and optional components, and collaborative work. N. Hess [7] proposes a wide range of practical techniques for large multilevel classes, emphasising that differences between learners can become a resource rather than an obstacle when learners help and learn from each other.

It is necessary to comment on the concept of learning styles, which is often associated with differentiation. H. Gardner's theory of multiple intelligences [8] and various learning style models have been widely used to justify differentiated instruction. However, H. Pashler and colleagues [9], in a comprehensive review, found no adequate evidence that matching instruction to learners' supposed learning styles improves learning outcomes. Therefore, in our view, differentiation in professionally oriented foreign language teaching should be based primarily on learners' readiness, that is, their current level of proficiency and skills, as well as on their interests and professional needs, rather than on learning style categories. At the same time, offering varied modes of presentation and activity remains useful for maintaining interest and engagement.

Areas of differentiation in professionally oriented foreign language teaching. Applying C.A. Tomlinson's model to the teaching of professional communication to non-philology students, four areas of differentiation can be distinguished. Table 1 presents these areas with examples of their implementation.

Table 1. Areas of differentiation in developing professional communicative competence

Area	**What is differentiated**	**Examples in professionally oriented English lessons**
Content	Complexity of texts and materials, amount of new language, depth of professional content	The same professional topic is presented through texts of different length and complexity; glossaries of key terms are provided for weaker students
Process	Type and amount of support, pace of work, grouping, complexity of tasks	Tiered tasks on the same text; sentence frames and phrase banks for weaker students; additional analytical questions for stronger students
Product	Form and complexity of the final outcome	A short oral summary, a structured presentation or a written report on the same professional problem, chosen according to level
Learning environment	Organisation of work, roles, atmosphere and use of resources	Mixed-ability teams with defined roles; quiet corners for independent work; access to online resources for extra practice

Differentiation of content is especially important in professionally oriented teaching, since authentic professional texts may be too difficult for weaker students. Instead of simplifying all materials to the lowest level, the teacher can provide parallel texts of different difficulty on the same topic, so that all students can contribute to the same discussion. Differentiation of process involves varying the amount of support and the complexity of tasks. Differentiation of product gives students the opportunity to demonstrate their learning in forms that correspond to their level, while still working on the same professional problem. Differentiation of the learning environment concerns the organisation of group work, the roles of students and the availability of additional resources.

Practical techniques of differentiation. Several practical techniques can be recommended for developing professional communicative competence in mixed-ability groups. The first technique is tiered tasks: tasks based on the same professional content but differing in complexity. For example, after reading a text about a company's marketing strategy, weaker students complete a table with key information, intermediate students summarise the strategy orally and stronger students evaluate its strengths and weaknesses and suggest improvements. All students then share their results, contributing to a common discussion.

The second technique is flexible grouping. Depending on the purpose of the activity, students work in groups of similar level (for example, to practise specific language at an appropriate level of difficulty) or in mixed-ability groups (for example, in projects and simulations, where stronger students can support weaker ones). Grouping should change regularly to avoid

labelling students. The third technique is open-ended communicative tasks, which can be performed at different levels. Tasks such as discussing a professional problem, planning a project or preparing a presentation allow each student to contribute according to his or her abilities.

The fourth technique is graded language support. Weaker students receive more support in the form of sentence frames, phrase banks, glossaries and models, while stronger students receive less support and are encouraged to use a wider range of language. As P. Gibbons [10] emphasises, scaffolding should be contingent on learners' current needs and gradually withdrawn as they become more competent. The fifth technique is choice: students are allowed to choose topics, materials or forms of final products from several options. Choice increases motivation and helps students take responsibility for their learning, which, as Z. Dörnyei [11] notes, is an important factor in sustaining motivation. R. Oxford [12] also emphasises that teaching learners to use appropriate learning strategies helps them compensate for gaps in their proficiency.

Cooperative learning in mixed-ability groups. Cooperative learning is a particularly effective approach for mixed-ability groups. D.W. Johnson and R.T. Johnson [13] identify positive interdependence, individual accountability, promotive interaction, social skills and group processing as the essential elements of cooperative learning. In mixed-ability teams working on professional communication tasks, these elements ensure that all students participate actively: each student has a specific role and responsibility, and the success of the team depends on the contribution of every member. Stronger students benefit from explaining and organising, while weaker students receive support and models from their peers. In this way, differences in proficiency become a resource for learning.

It should be noted that differentiation requires ongoing assessment of students' progress. Entry diagnostics at the beginning of the course, regular formative assessment and students' self-assessment based on CEFR descriptors [14] provide the information necessary for adjusting tasks and grouping. At the same time, the final learning outcomes in terms of professional communicative competence should be clearly defined for all students, so that differentiation concerns the path to these outcomes rather than lowering expectations for weaker students. T. Hutchinson and A. Waters [15] and H. Basturkmen [16] emphasise that ESP courses should be based on the analysis of learners' needs and abilities, and differentiation is a natural continuation of this principle at the level of classroom teaching. As J.J. Jalolov [17] notes, taking into account learners' individual characteristics is an important condition for effective foreign language teaching.

Conclusion. The considerable differences in students' language proficiency within one group are one of the main problems in developing the professional communicative competences of non-philology students. Differentiated instruction, based on L.S. Vygotsky's concept of the zone of proximal development, I.E. Unt's theory of individualisation and differentiation and C.A. Tomlinson's model, provides an effective way of addressing this problem. In professionally oriented foreign language teaching, differentiation should be based primarily on students' readiness, interests and professional needs rather than on learning style categories.

Differentiation of content, process, product and learning environment, implemented through tiered tasks, flexible grouping, open-ended communicative tasks, graded language support and choice, and combined with cooperative learning and ongoing assessment, allows all students to work within their zone of proximal development and to progress in developing their professional communicative competences. In this way, the heterogeneity of mixed-ability groups can be transformed from an obstacle into a resource for learning.

Further research will focus on developing a bank of tiered professional communication tasks for different non-philological fields of study and on designing diagnostic tools for grouping students according to their readiness.

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INTEGRATING SELF-DIRECTED LEARNING, INQUIRY-BASED INSTRUCTION, AND DIGITAL TECHNOLOGIES TO ENHANCE COGNITIVE ENGAGEMENT IN UNIVERSITY CHEMISTRY EDUCATION

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Abstract. *Developing students' capacity to regulate their own learning is increasingly central to chemistry education, where abstract representations, laboratory reasoning, and professional problem-solving must be coordinated. This article critically synthesizes and analytically reframes the pedagogical intervention reported in Usmanova's 2026 PhD dissertation abstract on independent learning in inorganic chemistry. The underlying study involved 302 students from 12 groups and 44 instructors at three technical higher education institutions in Uzbekistan; six groups were designated experimental and six control. Its instructional framework combined inquiry-based learning, flipped-classroom activities, self-directed learning, problem-oriented interactive tasks, and electronic learning resources. The reported comparative outcomes indicated effectiveness advantages of 16% for cognitive, 16% for procedural, and 17% for integrative criteria. Rather than treating these summary percentages as independent evidence of causal effect, the present article examines their pedagogical meaning, measurement assumptions, and implications for reproducible implementation. The analysis proposes a coherent mechanism linking structured autonomy, metacognitive reflection, disciplinary representation, and formative feedback. Findings support the promise of integrated independent-learning design while highlighting the need for transparent baseline data, effect sizes, and longitudinal follow-up.*

Keywords: *self-directed learning; inquiry-based learning; inorganic chemistry; cognitive engagement; metacognition; flipped classroom; digital pedagogy; technical higher education.*

Introduction

Chemistry education confronts a persistent tension: learners are expected to master symbolic conventions and conceptual explanations while also making judgments about unfamiliar materials, reactions, and industrial processes. Memorization alone cannot adequately support these demands. Students must plan an investigation, evaluate evidence, revise explanatory models, and transfer chemical knowledge to authentic situations. Consequently, cognitive engagement should be understood not simply as visible participation, but as sustained, purposeful investment in interpretation, reasoning, and self-monitoring.

Usmanova (2026) identifies this problem in the context of technical higher education in Uzbekistan and advances a model that coordinates independent work with inquiry-based learning, flipped instruction, problem-based activities, and digital resources. The dissertation abstract situates the model within educational modernization and the development of transferable competences, including critical thinking, creative reasoning, communication, and digital literacy.

Its distinctive contribution is not the introduction of any single technique, but the deliberate orchestration of multiple techniques around students' cognitive activity.

In chemistry, the explanatory burden is intensified by the need to connect macroscopic observations, submicroscopic interpretations, and symbolic representations (Johnstone, 1991). A learner who can reproduce an equation may still fail to explain why a reaction proceeds or how changes in conditions affect an industrial process. Thus, effective independent study requires purposeful movement between representational levels, supported by timely feedback and explicit criteria.

The central research question guiding this article is: how can the integrated instructional architecture documented in the dissertation be interpreted as a mechanism for strengthening cognitive, procedural, and integrative engagement in inorganic chemistry? Two subsidiary questions concern which elements are most readily transferable to other technical curricula and which methodological limitations must be resolved before strong causal claims are warranted.

This article is a secondary, source-based scholarly analysis, not a new field experiment. Its contribution is to reconstruct the intervention logic, critically interpret reported outcomes, and articulate a research-informed implementation and evaluation agenda. Numerical findings are attributed to the dissertation abstract and are not presented as independently recalculated estimates.

Materials and Methods

The primary documentary source was the 2026 dissertation abstract by Zokhida Sharifjonovna Usmanova, Methodology for Developing Students' Cognitive Activity through Independent Learning in an Innovative Educational Environment (using the example of teaching chemistry in technical universities). The present analysis extracted the stated research setting, participant structure, instructional strategies, assessment criteria, intervention stages, and reported comparative outcomes.

The original pedagogical investigation was conducted at Fergana Polytechnic Institute, Namangan Engineering and Construction Institute, and Jizzakh Polytechnic Institute. According to the abstract, 302 students studying inorganic chemistry in chemical technology programs participated across 12 instructional groups, alongside 44 teachers. Six groups served as experimental groups and six as controls. The research unfolded through formative development in 2022–2023 and final evaluation in 2023–2024; the abstract also describes preparatory and concluding phases of the overall instructional model.

The intervention integrated inquiry-based learning, the flipped classroom, self-directed learning, case analysis, brainstorming, Bloom-taxonomy-based quests, labyrinth tasks, and rapid questioning. Instructional supports included an electronic manual, an electronic database, laboratory and modeling activities, independent assignments, and monitoring with feedback. The abstract refers to an electronic educational resource registered as DGU No. 48500. The specific frequency, duration, and allocation of each intervention component are not sufficiently documented in the summary to support a component-level effect estimate.

Three outcome domains were extracted. The cognitive criterion concerns the application of acquired chemical knowledge to practical situations. The procedural criterion includes purposeful interaction with information sources and classroom contexts, communication, analysis of problem scenarios, and prediction of task outcomes. The integrative criterion concerns interdisciplinary application of inorganic chemistry, creative potential, and orientation toward continued development. The source reports a 100-point assessment framework for these domains.

The methodological stance is deliberately conservative. The abstract refers to Student's t-test and statistical analysis; however, the present article distinguishes a reported statistical conclusion from independently verifiable inferential evidence. Moreover, assignment by instructional group creates potential clustering, and teacher- or institution-level variation may influence results. These features inform the interpretation and recommendations below.

Results

The extracted intervention is best represented as a sequence of preparation, guided investigation, autonomous application, and reflection. Initial orientation clarifies goals and assessment expectations; independent preparation supplies readings and digital tasks; classroom inquiry provides collaborative explanation and experimentation; subsequent self-assessment identifies remaining conceptual difficulties. This sequence connects learner choice with instructional accountability rather than equating independence with unsupervised study.

The dissertation abstract reports comparative effectiveness advantages of 16% on the cognitive criterion, 16% on the procedural criterion, and 17% on the integrative criterion. These figures are reproduced as source-reported summary indicators. The abstract does not establish, in the material examined, whether they represent percentage-point differences, relative changes, or a particular composite index; therefore, their numerical interpretation should not be extended beyond the source's formulation.

Table 1. Outcomes reported in Usmanova (2026); percentages are not independently recalculated.

Assessment domain	Reported advantage	Interpretive focus
Cognitive	16%	Application and explanation of chemical knowledge
Procedural	16%	Communication, analysis, planning and prediction
Integrative	17%	Interdisciplinary transfer and creative development

The near-parallel advantages across the three domains suggest that the instructional framework may have influenced more than factual recall. In particular, the integrative criterion is aligned with the model's emphasis on professional contexts and interdisciplinary tasks. Nevertheless, the small difference between 16% and 17% should not be interpreted as evidence that integration improved more strongly than cognition or procedure; uncertainty intervals and scale characteristics are not available.

A useful pedagogical illustration is the dissertation's Bloom-based quest on oxides. Students first classify basic, acidic, and neutral oxides, then explain distinctions, supply reaction examples, compare categories through a Venn diagram, connect structure with chemical behavior, and evaluate products of reactions. The sequence progressively shifts responsibility from recognition toward explanation, comparison, and evaluative judgment. It is especially relevant to cognitive engagement because the task requires students to externalize reasoning rather than simply select a memorized response.

Taken together, the source-reported findings are consistent with the proposition that structured independent learning can strengthen students' engagement in technical chemistry education. They do not, on their own, isolate the unique contribution of digital resources, inquiry,

flipped preparation, or self-direction. The integrated model is therefore the defensible unit of interpretation.

Discussion

The first theoretical implication concerns the relationship between autonomy and scaffolding. Educational discourse sometimes positions independent learning as a withdrawal of teacher intervention. The reconstructed model suggests the opposite: autonomy becomes productive when learners encounter explicit questions, disciplinary resources, feedback cycles, and criteria for judging the adequacy of their explanations. This interpretation is consistent with the account of self-regulated learning as a cyclical process of forethought, performance monitoring, and self-reflection (Zimmerman, 2002).

Fourth, the digital component should be evaluated according to its pedagogical function, not its novelty. An electronic database may broaden access to reliable information; a virtual laboratory may enable safe exploration of otherwise inaccessible phenomena; a learning-management system may make progress and feedback visible. Yet excessive information, poorly designed interfaces, and unequal device access can undermine independence. Digital resources are therefore enabling conditions rather than sufficient causes of improved learning.

Conclusion

The dissertation-based evidence examined here indicates that a coordinated system of self-directed learning, inquiry-based instruction, flipped preparation, and digital support is a credible pedagogical approach for developing cognitive engagement in technical-university inorganic chemistry. The source reports comparative advantages of 16% for cognitive, 16% for procedural, and 17% for integrative criteria in an investigation involving 302 students across three Uzbek institutions. These outcomes provide a useful empirical starting point, although the summary does not permit independent verification of the magnitude, uncertainty, or causal attribution of the reported effects.

Future work should test the model through transparent, replicable, and longitudinal designs. With stronger measurement and explicit attention to equity, the approach has the potential to inform curriculum reform across chemical technology and related engineering disciplines.

Study type: secondary scholarly analysis of a published dissertation abstract; no new human-subject data were collected for this article. Data availability: the numerical summaries discussed are drawn from the supplied dissertation abstract; participant-level datasets were not available for reanalysis. Funding and conflicts of interest: to be completed by the submitting author. Authorship and institutional details: to be confirmed before submission.

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DEVELOPING LOGICAL THINKING IN ACADEMIC LYCEUM STUDENTS THROUGH AN OPEN LEARNING PLATFORM AND A TWO-LOOP FEEDBACK METHODOLOGY: A QUASI-EXPERIMENTAL STUDY IN UZBEKISTAN

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Abstract

Background. *Uzbekistan admits students to academic lyceums partly on the basis of a logical reasoning test, yet lyceum curricula contain no systematic means of developing that ability, and existing digital tools are used mainly to deliver content and check final answers.*

Objective. *The study evaluated an open, purpose-built learning platform ("Mantiqiy tafakkur") combined with a topic-cycle methodology in which feedback is shared between the platform (an inner loop) and the teacher (an outer loop).*

Methods. *A quasi-experimental pre-test/post-test design with non-equivalent intact groups was conducted in three academic lyceums (N = 465; experimental group n = 233, control group n = 232) between 2023 and 2026, with a one-year intervention in 2024–2025. Logical thinking was assessed on four criteria (motivational-value, cognitive-operational, algorithmic-procedural and reflective-evaluative), each with three behaviourally anchored indicators, and classified into low, medium and high levels. Group distributions were compared with Pearson's χ^2 and the Mann–Whitney U test; Student's t-test and Cohen's d were computed on coded level scores.*

Results. *At baseline the groups did not differ on any criterion ($\chi^2(2) = 0.09–0.55$, $p \geq .76$). At post-test the share of students at the medium or high level rose from 25.6% to 76.6% in the experimental group and from 25.3% to 37.2% in the control group. Differences favoured the experimental group on all four criteria ($\chi^2(2) = 71.93–75.14$, Cramér's $V = .39–.40$, $p < .001$; $d = 0.74–0.75$) and were consistent across the three sites.*

Conclusions. *A lightweight open platform can produce substantial gains in logical thinking when it is embedded in a methodology that links every logical operation to a platform component and assigns complementary feedback roles to the software and the teacher.*

Keywords: *logical thinking; computational thinking; formative feedback; educational platform; secondary education; quasi-experiment; Uzbekistan*

1. Introduction

Across education systems, the quality of schooling is increasingly judged by whether students can use knowledge in unfamiliar situations, justify conclusions and solve problems independently, rather than by the volume of knowledge they reproduce. The PISA 2022 framework places mathematical reasoning at the centre of mathematical literacy (OECD, 2023a). Uzbekistan took part in PISA for the first time in that cycle, and its 15-year-olds scored well below the OECD average in mathematics (OECD, 2023b). The result matters for upper-secondary education because the cohort tested by PISA is the cohort that enters academic lyceums: selective upper-

secondary schools affiliated with universities and intended to prepare students for higher education.

National regulation already treats logical reasoning as a valued outcome. Since 2020, admission to academic lyceums has included a test of intellectual ability and logical reasoning (President of the Republic of Uzbekistan, 2020), and the current admission procedure approves a separate list of preparatory literature for that test every year (Cabinet of Ministers of the Republic of Uzbekistan, 2024). Logical reasoning is thus measured at entry, but once students are admitted, no mechanism ensures that it continues to develop. In practice, its cultivation depends on individual teachers, while time pressure and preparation for university entrance examinations favour reproductive methods built around worked examples.

Digital tools are often proposed as a remedy, but the evidence warns against assuming that technology improves learning by itself. Analyses of PISA data have shown that heavier computer use at school is not consistently associated with better outcomes (OECD, 2015). In contrast, a meta-analysis of secondary mathematics and science studies found positive effects of digital tools, which were larger when tools supplemented rather than replaced other materials and when teachers had been trained to use them (Hillmayr et al., 2020). The question is therefore not whether to use software but how software must be designed and embedded in teaching to develop logical thinking.

This article reports the design and evaluation of such an approach. Its aim was to determine whether an open learning platform, built around the logical operations that lyceum students need and used within a methodology that distributes feedback between the platform and the teacher, improves students' logical thinking compared with regular instruction. Two research questions guided the study: (RQ1) Does the intervention increase the proportion of students at medium and high levels of logical thinking compared with regular instruction? (RQ2) Is the effect consistent across the motivational, cognitive, procedural and reflective components of logical thinking, and across different schools?

2. Theoretical Background

2.1. Logical thinking as a system of operations

Formal logic describes the structure of correct thought (concepts, judgements and inferences governed by the laws of identity, non-contradiction, excluded middle and sufficient reason) but not how that structure develops in a learner. Developmental and activity-based psychology fills this gap. Inhelder and Piaget (1958) showed that adolescence brings formal operations: hypothetico-deductive reasoning, control of variables and combinatorial thinking. Lawson's (1978) classroom test of formal reasoning, however, revealed large differences among students of the same age, so a selective lyceum intake cannot be assumed to be homogeneous. Activity theory holds that a mental operation is first mastered as a conscious, goal-directed action and is automated only through repetition (Leont'ev, 1975). Gal'perin's (1966) theory of the stage-by-stage formation of mental actions, together with Talyzina's (1984) account of how this process can be managed, describes the route from material, externalised action through external speech to an internal mental plan, and shows that regular feedback is a necessary condition for controlling it.

On this basis, the study defined the logical thinking of an academic lyceum student as a system of analysis, synthesis, comparison, generalisation, classification and algorithmisation operations that, applied to subject content, enables the student to use concepts precisely, form justified judgements and draw conclusions; it is manifested together with reflection, the ability to check and evaluate one's own reasoning. Including algorithmisation reflects the view that computational thinking (Shute et al., 2017; Wing, 2006) is the form logical thinking takes in a

digital environment. Treating reflection as part of the construct follows from research on metacognitive monitoring (Flavell, 1979) and on the tendency of fast, intuitive answers to go unchecked (Kahneman, 2011). The definition yields four measurable components: motivational-value, cognitive-operational, algorithmic-procedural and reflective-evaluative.

2.2. What software can contribute

Four strands of evidence identify what software can add to the development of logical thinking. First, *step-level feedback* is decisive: intelligent tutoring systems that respond to each solution step approach the effectiveness of human tutors (VanLehn, 2011), and such systems outperform teacher-led large-group instruction (g = 0.44; Ma et al., 2014; see also Kulik & Fletcher, 2016). Second, the *informational content of feedback* matters more than its presence: a meta-analysis of 435 studies found a medium overall effect of feedback (d = 0.48), strongly moderated by how much information it conveys (Wisniewski et al., 2020; see also Black & Wiliam, 1998). Third, learning to program and other computational activities transfer to reasoning and mathematics, but the transfer is stronger to near domains (Scherer et al., 2019; Ye et al., 2022). This argues for practising logical operations on the subject matter in which they will be used. Fourth, novices learn poorly from unguided discovery (Kirschner et al., 2006) and from interfaces that overload working memory (Mayer, 2009; Sweller, 1988), and the main difficulty of novice programmers lies in planning a solution rather than in syntax (Robins et al., 2003).

2.3. Research gap

Reviews of computational-thinking research note that most studies measure knowledge outcomes rather than the thinking process (Grover & Pea, 2013; Lye & Koh, 2014). Widely available tools each cover only part of what is needed. Block-based environments develop algorithmisation but are weakly connected to subject content. Learning management systems grade final answers without exposing the reasoning behind them. Step-based tutors are scarcely available in Uzbek or aligned with lyceum curricula. Moreover, a school-built platform rarely has the learner modelling of an intelligent tutor. What is missing is an approach that combines a modest, accessible platform with a teaching methodology that compensates for its limitations. The present study addresses this gap.

3. Method

3.1. Design

A quasi-experimental pre-test/post-test design with non-equivalent intact groups was used (Shadish et al., 2002). Students were not reassigned; instead, existing study groups in each lyceum were designated as experimental (EG) or control (CG) groups, and baseline equivalence was tested statistically. The independent variable was the instructional condition (platform-based methodology vs. regular instruction); the dependent variable was the level of development of logical thinking on four criteria. The study comprised three stages carried out over three academic years. The ascertaining stage (2023–2024) covered teacher interviews and questionnaires and the baseline diagnosis. The formative stage (2024–2025) covered the intervention, with an interim diagnosis at the end of the first semester. The final stage (2025–2026) covered the post-test, the statistical analysis of the results and the formulation of conclusions.

3.2. Participants and setting

The study involved 465 students aged 15–18 from academic lyceums affiliated with three higher-education institutions in different regions: Samarkand State Pedagogical Institute, Uzbekistan National Pedagogical University (Tashkent) and Gulistan State Pedagogical Institute (Table 1). The sites were chosen for regional diversity, the availability of computer classrooms or

personal devices, and comparable mathematics and informatics curricula. Both conditions followed the same curriculum with the same number of lessons. Where possible, the same teacher taught the experimental and control groups in a lyceum, to reduce the influence of teacher skill. Students and parents were informed about the purpose of the study, data were processed anonymously, and, because the platform is open, control students could use it freely after the study ended.

Table 1

Distribution of participants by site and condition

Academic lyceum affiliated with	EG	CG	Total
Samarkand State Pedagogical Institute	78	77	155
Uzbekistan National Pedagogical University	78	77	155
Gulistan State Pedagogical Institute	77	78	155
Total	**233**	**232**	**465**

3.3. Intervention

The platform. "Mantiqiy tafakkur" (Logical Thinking; litsey.e-darslar.uz) was designed by the author by adapting the ADDIE model (Branch, 2009). It is an open web resource that requires no registration and works on computers, tablets and phones, so that students can reach the content with a single click, both at school and at home. Content was selected according to two criteria. *Logical density* means that a topic must require at least two different logical operations. *Transferability* means that the operation practised must be usable in other subjects. Four modules resulted: (1) sets and elements of mathematical logic; (2) equations and inequalities; (3) geometry problems; and (4) cross-curricular logic tasks (sequences, proportionality, inference). Each lecture is designed as a single didactic unit together with its embedded quiz. Items appear one at a time, their order is randomised on every attempt, and the result screen shows the score and an explanation for every item. Distractors are written to reflect typical logical errors (for example, inferring "not A, therefore not B" from "if A then B"). Interactive logic exercises give immediate correctness checks and worked explanations, and two general tests ("Sequences and patterns"; "Mathematical logic and inference") assess reasoning independently of the topic just taught. A methodological-guidance section offers self-assessment questions, worked tasks with hidden answers and a 15-minute daily practice plan.

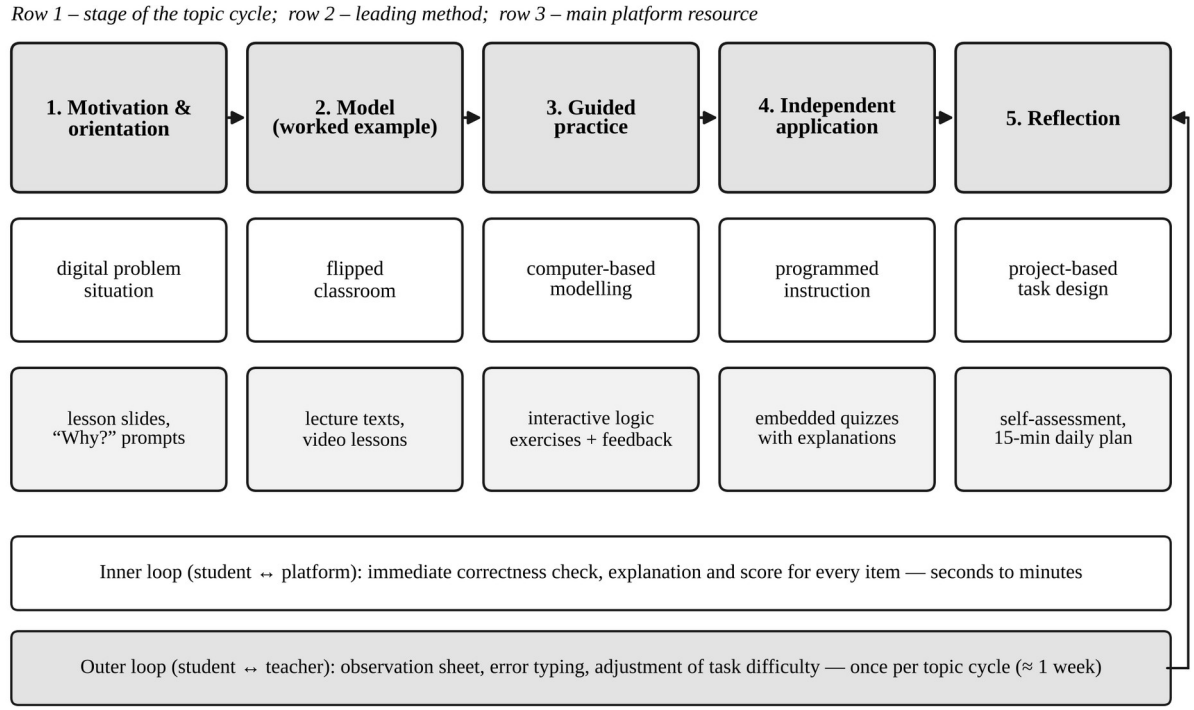
The topic cycle. Instruction in the EG was organised in cycles of about one week (two lessons plus independent work) with five stages (Figure 1). Each stage was led by one method that relies on a specific platform function: a digital problem situation (motivation and orientation), the flipped classroom (model), computer-based modelling (guided practice), programmed instruction (independent application) and project-based design of logic tasks (reflection). Because the platform records only final answers, two low-tech supplements were built in. During guided practice, partners had to explain their solution to each other before pressing "Check", which provides the external-speech stage of Gal'perin's (1966) sequence. In addition, each student kept a notebook in which the solution path was recorded.

Two feedback loops. In the inner loop (student ↔ platform), each exercise and quiz item returns an immediate check, explanation and score; this feedback is fast but short-lived. In the outer loop (student ↔ teacher), the teacher records quiz and general-test results and the dominant error

type on an observation sheet once per cycle, and adjusts task difficulty and corrective tasks for the next cycle. The weekly rhythm was chosen deliberately. Intervening on every error would deprive students of the chance to correct themselves from the explanation, whereas waiting until the end of the term would allow faulty strategies to become entrenched. Students were also differentiated by comparing topic-quiz and general-test results, which distinguishes mechanical knowledge from transferable reasoning. Control groups were taught in the usual way, using the textbook and conventional methods.

Figure 1

The topic cycle used in the experimental groups and the two feedback loops



3.4. Measures

Logical thinking was assessed on four criteria, each operationalised by three observable indicators (Table 2). Every indicator was scored 1 (low), 2 (medium) or 3 (high). For test-based indicators, the cut-offs were below 60%, 60–84% and 85% or above. For observation-based indicators, teachers received behavioural anchors: for example, for "corrects the error independently", 1 = only with the teacher's help, 2 = after reading the platform explanation, and 3 = finds and corrects the error without the explanation and can explain how. Criterion scores therefore ranged from 3 to 9 and were classified as low (3–4), medium (5–7) or high (8–9). To support reliability, test items were piloted with students outside the sample, and items that were too easy or too difficult were replaced. The internal consistency of the questionnaire was checked with Cronbach's α, and for the observation indicators the independent ratings of two teachers were compared. Teachers in the experimental groups attended a practical seminar on using the platform, keeping the observation sheet and classifying logical errors before the formative stage began.

Table 2

Criteria, indicators and instruments

Criterion	Indicators	Instruments
Motivational-value	Interest in logic tasks; voluntary choice and completion of difficult tasks; independent and regular use of the platform	Questionnaire; observation sheet; notebook and daily plan
Cognitive-operational	Analysis and comparison; generalisation and classification; deductive and inductive inference	General logic tests; tasks based on Lawson's (1978) test
Algorithmic-procedural	Breaking a solution into steps and planning; correctness and economy of the step sequence; representing the problem as a model	Notebook analysis; modelling tasks
Reflective-evaluative	Checking the answer before submitting; identifying the error type; correcting the error and explaining the correction	Observation sheet; analysis of quiz explanations; interview

3.5. Data analysis

Because levels are ordinal, the primary analyses compared the distributions of students across the three levels in the EG and CG for each criterion, using Pearson's χ^2 test for a 2×3 table ($df = 2$), with Cramér's V as the effect size, and the Mann–Whitney U test with the rank-biserial correlation. Following common practice in pedagogical research in the region, levels were also coded 3, 4 and 5 to obtain a mean attainment score. Mean scores were compared with Student's t-test for independent samples ($df = 463$) and Cohen's (1988) d. The ratio of the EG mean to the CG mean is reported as an efficiency ratio (R). All tests were two-tailed with $\alpha = .05$. Calculations were performed in IBM SPSS and checked independently from the frequency tables.

4. Results

4.1. Baseline equivalence

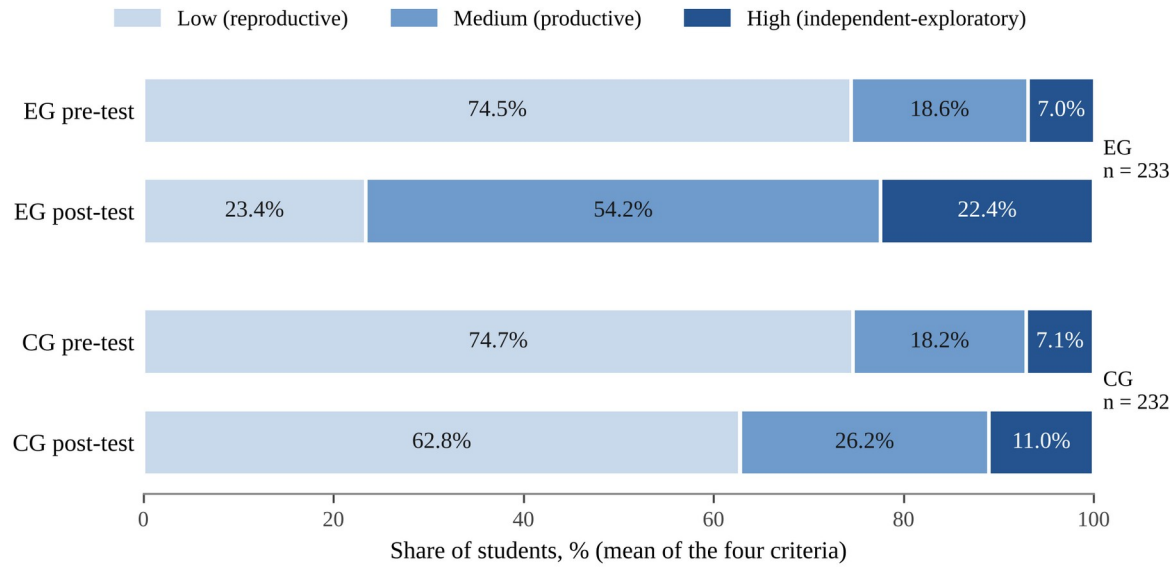
At baseline, about three quarters of the students in both conditions were at the low level (averaged across criteria: EG 74.5%, CG 74.7%), and only 7.0% and 7.1% were at the high level. The groups did not differ on any criterion: $\chi^2(2)$ ranged from 0.09 to 0.55 ($p \geq .76$, $V \leq .03$), Mann–Whitney tests were non-significant ($p \geq .83$), mean scores ranged from 3.31 to 3.34, and $|d| \leq 0.01$ (Table 3). The groups can therefore be treated as equivalent at the outset.

4.2. Post-test differences

After the intervention, the EG distribution had shifted markedly towards the medium and high levels. Averaged across criteria, the share of EG students at the low level fell from 74.5% to 23.4%, the medium level rose from 18.6% to 54.2%, and the high level rose from 7.0% to 22.4% (Figure 2). In the CG, the corresponding post-test values were 62.8%, 26.2% and 11.0%. The proportion at the medium or high level thus rose from 25.6% to 76.6% in the EG (+51.0 percentage points) and from 25.3% to 37.2% in the CG (+11.9 points). With respect to RQ1, the intervention roughly doubled the share of students reaching at least the productive level, compared with regular instruction.

Figure 2

Distribution of students across levels of logical thinking before and after the intervention (mean of the four criteria)



Differences at post-test were statistically significant and of similar size on every criterion (Table 3). The χ^2 values ranged from 71.93 to 75.14 ($p < .001$) with Cramér's V of .39–.40, and Mann–Whitney tests confirmed the shift ($U = 37\,589$–$37\,741$, $p < .001$, rank-biserial $r = .39$–$.40$). Mean scores were 3.98–4.00 in the EG and 3.47–3.49 in the CG ($t(463) = 7.96$–8.11, $p < .001$; $d = 0.74$–0.75; $R = 1.14$–1.15). The highest EG mean was observed for the algorithmic-procedural criterion (4.00), and the lowest efficiency ratio for the cognitive-operational criterion (1.14).

Table 3

Comparison of experimental and control groups at pre-test and post-test

Criterion	Phase	EG M (SD)	CG M (SD)	$\chi^2(2)$	V	t(463)	d
Motivational-value	Pre	3.32 (0.59)	3.31 (0.60)	0.44	.03	0.05	0.00
	Post	3.99 (0.69)	3.47 (0.69)	74.49***	.40	8.08***	0.75
Cognitive-operational	Pre	3.33 (0.62)	3.33 (0.59)	0.46	.03	0.13	0.01
	Post	3.98 (0.67)	3.48 (0.68)	71.93***	.39	8.01***	0.74
Algorithmic-procedural	Pre	3.33 (0.59)	3.34 (0.62)	0.55	.03	−0.10	−0.01
	Post	4.00 (0.68)	3.49 (0.70)	73.45***	.40	7.96***	0.74
Reflective-evaluative	Pre	3.32 (0.60)	3.32 (0.60)	0.09	.01	−0.02	0.00
	Post	3.99 (0.67)	3.48 (0.68)	75.14***	.40	8.11***	0.75

Note. EG n = 233, CG n = 232. Means are based on level codes (low = 3, medium = 4, high = 5). χ^2 refers to the 2 × 3 table of level frequencies; V = Cramér's V; d = Cohen's d. ***p < .001.

4.3. Consistency across components and sites

Regarding RQ2, the gains were remarkably even across components. Post-test effect sizes differed by no more than 0.01 in d and .01 in V across the four criteria, which suggests that the methodology did not favour the cognitive core at the expense of motivation or reflection. The effect was also consistent across sites. At post-test, the share of EG students at the medium or high level was 76.6% (Samarkand), 77.2% (Tashkent) and 76.0% (Gulistan), compared with 37.3%, 37.7% and 36.5% in the respective CGs. Within each site, all four criteria differed significantly ($\chi^2(2) = 21.22–27.80$, $p < .001$), with d ranging from 0.70 to 0.77. The CGs also improved, which is expected from regular instruction and maturation over the study period, but their gain was less than a quarter of that in the EGs.

5. Discussion

The study shows that a deliberately modest platform can produce substantial gains in logical thinking when it is embedded in a coherent methodology. The post-test effect ($d \approx 0.75$) exceeds the average effect of feedback reported by Wisniewski et al. (2020) and the advantage of intelligent tutoring systems over large-group instruction reported by Ma et al. (2014). Such comparisons should be made cautiously, because the outcome here was a researcher-designed, level-based measure that is likely to be more sensitive than standardised achievement tests. Nonetheless, the size and consistency of the effect across three regions argue against a site-specific explanation.

Two features of the design are plausible mechanisms. The first is the explicit link between each logical operation and a platform component. Every operation in the working definition was practised in at least two components (for example, comparison through quiz distractors and general tests, and algorithmisation through interactive exercises, the “pause and solve” mode of video lessons and the solution notebook), so no operation depended solely on the teacher’s verbal instruction. This matches the meta-analytic finding that transfer is stronger when the practised operation is close to the target domain (Scherer et al., 2019; Ye et al., 2022). The second is the division of feedback labour. The platform supplied immediate, item-level explanations to a whole class at once, which no teacher can do. The teacher supplied what the platform could not: memory of each student’s recurring error type and a decision about the next task. This arrangement approximates step-level feedback (VanLehn, 2011) without a learner model, and it is consistent with the finding that digital tools work better when teachers remain actively involved (Hillmayr et al., 2020).

The even gains on the reflective-evaluative criterion deserve comment. Reflection is often treated as a by-product of cognitive gains, but here it was targeted directly. Students had to read the explanation and record the error type before retaking a quiz, explain their solution to a partner before checking it, and answer self-assessment questions in their daily plan. These routines turn Flavell’s (1979) metacognitive monitoring into observable behaviour and counter the tendency to accept the first intuitive answer (Kahneman, 2011). The slightly lower efficiency ratio on the cognitive-operational criterion is consistent with the view that transferring operations to unfamiliar material takes longer than acquiring them in familiar contexts.

5.1. Limitations

Several limitations qualify these conclusions. First, intact groups were used without randomisation. Baseline equivalence was demonstrated, but unmeasured differences, such as class climate, cannot be excluded. Second, some indicators relied on teacher ratings, and raters were not blind to condition. Behavioural anchors and double rating reduce, but do not eliminate, expectancy

bias. Third, analyses were conducted at the level of category frequencies; individual-level change scores and models accounting for the clustering of students within classes (e.g., multilevel or ANCOVA models) were not available. Fourth, t-tests and d were computed on ordinal codes and should be read as complementary to the distribution-based tests. Fifth, the intervention combined the platform with a teaching methodology and teacher training, so the study evaluates the package rather than the platform alone, and its long-term retention was not examined. Finally, the platform does not yet store individual results, so usage data could not be analysed.

5.2. Implications

For practice, the findings suggest that schools need not wait for sophisticated adaptive systems. An open platform with item-level explanations, error-based distractors and randomised quizzes, combined with simple paper-based tools (solution notebooks and observation sheets) and a weekly feedback rhythm, can deliver much of the benefit of step-based tutoring. For teacher education, the results support preparing teachers to integrate content, pedagogy and technology (Mishra & Koehler, 2006), specifically to classify logical errors and to act on them. For research, the next steps are a randomised or cluster-randomised replication, the use of standardised reasoning measures alongside level-based criteria, and the addition of an optional results-logging module that would allow learning trajectories to be analysed.

6. Conclusion

A purpose-built, open learning platform used within a five-stage topic cycle with two feedback loops raised the proportion of academic lyceum students at medium or high levels of logical thinking from about one quarter to more than three quarters after a one-year intervention. Under regular instruction, the proportion rose only to just over one third. The effect was statistically significant, of moderate-to-large size and consistent across components and sites. The main lesson is that the value of educational software for developing logical thinking lies less in its technical sophistication than in how precisely its functions are mapped onto logical operations and how the feedback it gives is complemented by the teacher.

Declarations

Ethics statement. The study was conducted in accordance with the ethical principles of educational research. Students and their parents were informed of the aims of the study, participation data were processed anonymously and used for research purposes only, and control-group students were given free access to the platform after the study.

Conflict of interest. The author developed the “Mantiqiy tafakkur” platform evaluated in this study. The platform is free and non-commercial. The author declares no other conflict of interest.

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Data availability. Aggregated frequency data supporting the findings are reported in the article; further data are available from the author on reasonable request.

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THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR DEVELOPING THE METACOGNITIVE COMPETENCIES OF FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *This article provides a systematic examination of the theoretical and methodological foundations for developing the metacognitive competencies of prospective primary school teachers. The study aims to provide a scientific basis for methodological approaches that enable future educators to understand, monitor, and manage their own cognitive processes, as well as to foster the intellectual-reflective potential of primary school-aged students. The article presents an original definition of "metacognitive competence of a prospective primary school teacher," outlines its four-component structure and the principles for its development, and proposes a conceptual-methodological model for its cultivation within the context of higher pedagogical education.*

Keywords: *metacognitive competence, prospective primary school teacher, theoretical-methodological foundation, metacognitive regulation, pedagogical reflection, cognitive strategy, conceptual model.*

INTRODUCTION. The shift in the modern educational paradigm—from an information-reproductive model to one that is person-centered, developmental, and competency-based—imposes entirely new requirements on the professional preparation of prospective primary school teachers. Today, the primary education stage is viewed not merely as a period for teaching students basic reading, writing, and arithmetic skills, but as a foundational phase for developing independent learning ("learning how to learn"), critical thinking, and the ability to consciously manage one's own learning activities [1; 2]. This, in turn, necessitates that educators themselves possess a high level of metacognitive competencies.

In the strategic documents of the Republic of Uzbekistan aimed at enhancing the quality of education and improving the system for training pedagogical personnel, the development of future teachers' professional-methodological potential, independent thinking, and readiness for innovative activity is defined as a priority objective [1; 2]. While traditional higher pedagogical education has primarily focused on mastering the foundations of academic subjects (the cognitive component) and applying pre-existing methodological recommendations, the contemporary context places critical importance on a teacher's ability to analyze their own cognitive processes, forecast ambiguous pedagogical situations, and manage the cognitive strategies of primary school-aged students.

A comparative analysis of scientific literature indicates that the concept of "metacognition" (knowledge about knowledge) was first introduced into academic discourse within the field of cognitive psychology by J. Flavell. It refers to an individual's knowledge regarding their own

cognitive processes and the products of those processes, as well as the mechanisms for actively monitoring and regulating them. Subsequently, researchers such as A. Brown, G. Schraw, and R. Dennison [6] delved into the internal structure of metacognition, dividing it into two primary components—metacognitive knowledge and metacognitive regulation—and interpreted it as a key factor determining the effectiveness of learning activities.

Scholars from CIS countries—A. V. Karpov, M. A. Kholodnaya [8], and S. N. Kostromina [9]—have explored the role of metacognitive processes in organizing intellectual activity, the management of an individual's intellectual resources, and the psychological-pedagogical mechanisms underlying reflection within professional-pedagogical practice. Similarly, researchers in the fields of pedagogy and psychology in Uzbekistan have extensively studied issues such as the professional competence of future teachers, the creative organization of primary education, and the development of students' reflective culture and capacity for independent learning [3; 10; 11].

However, an analysis of existing scientific research indicates that the development of metacognitive competencies among future primary school teachers has not been sufficiently investigated as a cohesive theoretical-methodological system. In particular, there is a need for a robust theoretical foundation—including methodological bases and a conceptual model—for transforming metacognitive knowledge into professional-pedagogical management skills, specifically tailored to the age-related and psychological characteristics of primary school pupils (such as the transition from visual-figurative to logical thinking and the development of voluntary attention).

The purpose of the research is to determine the theoretical and methodological foundations for developing the metacognitive competencies of prospective primary school teachers, and to provide a scientific basis for their structural composition, principles, and a conceptual-methodological model.

Research objectives:

1. To elucidate the essence of the concept of "metacognitive competence of a prospective primary school teacher" based on an analysis of philosophical, psychological, and pedagogical sources;

2. To systematize the methodological approaches and principles that facilitate the development of metacognitive competencies in prospective primary school teachers;

3. To identify the structural composition and functional components of metacognitive competence;

4. To develop a comprehensive conceptual-methodological model for the development of this competence within the process of higher pedagogical education.

METHODOLOGY AND RESEARCH METHODS. Investigating the development of metacognitive competencies in prospective primary school teachers requires a multi-level methodological framework encompassing philosophical, national, specific scientific, and technological dimensions. The theoretical-methodological foundation of the research was formed by the dialectical integration of the following scientific approaches:

1. The Systems Approach (V.G. Afanasyev, E.G. Yudin) — allowed for the conceptualization of metacognitive competence as a set of interconnected and complementary components within the holistic system of a prospective primary school teacher's professional training, while also facilitating its seamless integration with the substantive and technological elements of higher education.

2. The Competency-Based Approach (I.A. Zimnyaya, A.V. Khutorskoy, N.A. Muslimov) — ensured the integration of the prospective educator's acquired theoretical knowledge and cognitive skills into real-world pedagogical situations—specifically, by fostering self-regulation and the organization of cognitive activity among primary school students [10; 13; 14]. 3. The reflexive-activity approach (L.S. Vygotsky, A.N. Leontiev, G.P. Shchedrovitsky, A.V. Karpov) served as a foundation for mechanisms through which a student continuously analyzes their own learning and quasi-professional activities, identifies the causes of cognitive errors, engages in self-assessment, and restructures their cognitive strategies [7; 15].

3. The constructivist (metacognitive) approach (J. Piaget, J. Flavell, D. Kuhn) is based on the idea that, rather than knowledge being transmitted to the subject in a ready-made form, the prospective teacher actively constructs professional knowledge by consciously managing their own thought processes, independently overcoming cognitive obstacles, and engaging in reflexive inquiry [4; 16].

4. Person-centered and acmeological approach (B.G. Ananyev, A.A. Derkach) — focused on accounting for a student's individual cognitive styles (field-dependence/independence, reflexivity/impulsivity) and realizing their potential for professional self-development and self-actualization (*acme*) [8; 14].

The following theoretical research methods were employed during the study:

- Comparative-analytical method: in-depth analysis of domestic and foreign philosophical, psychological, and pedagogical literature, dissertations, and regulatory-legal documents;
- Systematization and classification: determining the interrelationships among the categories of metacognition, reflection, and professional competence, and breaking them down into their constituent components;
- Terminological analysis: defining the conceptual boundaries of terms such as "metacognition," "metacognitive ability," "metacognitive strategy," and "metacognitive competence";
- Conceptual modeling: designing a structural-functional model for the process of developing metacognitive competencies in future primary school teachers.

RESULTS. As a result of an in-depth theoretical and methodological analysis, the conceptual foundations for developing the metacognitive competencies of prospective primary school teachers have been established.

1. An original interpretation of the concept "metacognitive competence of a prospective primary school teacher." Based on a synthesis of theoretical perspectives found in scientific literature [13], the following original definition is proposed: the metacognitive competence of a prospective primary school teacher is an integral personal-professional quality. It encompasses an educator's profound awareness of their own cognitive processes, intellectual resources, and learning strategies; the ability to independently plan, monitor, evaluate, and adjust their professional pedagogical activities; and a readiness to purposefully foster self-regulation and reflective thinking skills in primary-school-aged students.

2. The structural composition of metacognitive competence. Through systemic and functional analysis, four closely interrelated components of a prospective primary school teacher's

metacognitive competence have been identified(Figure1).

Structural Composition of the Metacognitive Competence of a Future Primary School Teacher

Component Name	Theoretical Content	Professional-Pedagogical Function
1. Metacognitive Knowledge Component	An individual's knowledge of their own cognitive characteristics (declarative knowledge), methods for solving various educational and professional tasks (procedural knowledge), and when and why to apply a specific strategy (conditional knowledge) [4; 6].	The ability to scientifically select teaching strategies suited to the age, attention, memory, and thinking characteristics of primary school students.
2. Metacognitive Regulation (Management) Component	Skills in pre-planning activities, goal setting, continuous process observation (cognitive monitoring), managing information flow, identifying errors, and evaluating outcomes [5; 6].	Rapidly adapting to unexpected didactic situations when designing the lesson process and adjusting the educational trajectory based on students' mastery levels.
3. Reflective-Analytical Component	The ability to critically analyze one's own thinking and pedagogical actions as an object, understand the cause-and-effect relationships of successes and difficulties, and perform self-assessment [7; 9].	Conducting an in-depth analysis of the effectiveness of delivered lessons and pedagogical actions, as well as fostering initial self-analysis skills in primary school students.
4. Motivational-Value Component	An intrinsic drive for intellectual self-development, psychological readiness to overcome cognitive difficulties and problematic situations, and accepting professional reflection as a pedagogical value [8; 10].	Sustainability of the need for continuous professional growth (lifelong learning) and fostering intrinsic motivation for learning in students.

Figure 1. Structural composition of the metacognitive competence of a prospective primary school teacher

3. Methodological principles for developing metacognitive competence. It has been established that the formation of metacognitive competencies during the training of future primary school teachers must rely not only on general didactic principles but also on the following specific methodological principles:

- The principle of consciousness and agency in cognitive activity: the student should develop not as a passive participant in the educational process, but as an active agent who understands not only "what to learn," but also the mechanisms of "how to learn effectively" and "how to teach primary school pupils to think independently."
- The principle of dual metacognitive orientation (binarity): during the educational process, the student must simultaneously occupy two roles—that of a learner (managing their own cognitive processes) and that of a future educator (guiding the cognitive activity of primary school-aged pupils and teaching them to engage in reflection).
- The principle of designing a reflective environment: creating a reflective environment—within every academic module, seminar session, and stage of pedagogical practice in higher education—that encourages students to analyze their own activities, ask questions, and seek alternative solutions.
- The principle of cognitive visualization and modeling: externalizing internal, latent thought processes—that is, creating visual models through thinking algorithms, mind maps, cognitive tables, and maps of problematic situations [8; 11];
- The principle of constructively overcoming cognitive challenges: creating an appropriate level of intellectual obstacles (cognitive dissonance) for students during the learning process, thereby prompting them to move away from automatic actions and engage conscious metacognitive control mechanisms [15; 16].

4. A conceptual-methodological model for the development of metacognitive competence. Based on a synthesis of the study's theoretical findings, an integrated conceptual-methodological model for developing the metacognitive competencies of prospective primary school teachers within the context of higher pedagogical education has been devised (Figure 2).

Conceptual-Methodological Model for Developing Metacognitive Competences of Future Primary School Teachers

Model Blocks		Structural Elements and Their Content
	1. Target-Methodological Block	**Social order:** training an independent-thinking, reflective, and methodically adaptable primary school teacher. **Goal:** systematic development of metacognitive competences in future primary school teachers. **Approaches:** systemic, competency-based, reflective-activity, constructivist, learner-centered. **Principles:** consciousness, dual metacognitive orientation, designing a reflective environment, cognitive visualization, overcoming cognitive difficulties.
	2. Content Block	**Interdisciplinary integration:** enriching the content of 'General Pedagogy', 'Developmental and Pedagogical Psychology', and 'Primary Education Methodology' with metacognitive knowledge and strategies. **Special course:** introducing the elective course 'Pedagogical Metacognition of a Future Teacher'. **Pedagogical practice:** including tasks of metacognitive analysis and creating a reflective map of the lesson in internship assignments.
	3. Technological-Activity Block	**Stages:** orientation-motivational, cognitive-operational, reflective-regulatory stages. **Methods and technologies:** 'think-aloud protocol', metacognitive questioning technique, reflective journals, case studies, problem-heuristic situations, mind mapping, KWL and INSERT strategies.
	4. Evaluative-Outcome Block	**Criteria:** cognitive-knowledge, regulatory-management, reflective-analytical, motivational-value criteria. **Development levels:** reproductive-intuitive (low), analytical-situational (medium), creative-regulatory (high) levels. **Outcome:** a future primary school teacher with developed metacognitive competence.

Figure 2. Structure of the conceptual-methodological model for developing the metacognitive competencies of prospective primary school teachers

DISCUSSION. When the theoretical-methodological results obtained during the study are compared with fundamental perspectives in modern psychology and pedagogy, it becomes necessary to discuss several significant scientific conclusions.

First, although the classic psychological model of metacognition—comprising two components (knowledge and regulation) as established by J. Flavell[4] and A. Brown[5]—is universal for general cognitive activity, it requires expansion and "pedagogization" within the context of the professional training of future primary school teachers. This is because, for a primary school teacher, merely monitoring one's own thinking is insufficient; the teacher must be able to didactically reconstruct their own metacognitive experience and adapt it to the "zone of proximal development" (L.S. Vygotsky)[15] of primary-school-aged students. Therefore, in the structure we propose, the explicit inclusion of "reflexive-analytical" and "motivational-value" components more comprehensively reflects the socio-humanistic and managerial dimensions of pedagogical activity.

Second, M.A. Kholodnaya[8] and A.V. Research by Karpov[7] demonstrates that the development of intellectual abilities and reflective processes is directly linked to an individual's reorganization of their own cognitive experience. However, in the practice of higher pedagogical education, the tendency to provide prospective teachers with ready-made methodological "recipes" often leads to "cognitive passivity" among students. The principle of dual metacognitive orientation (binarity) within the model we have developed is specifically designed to resolve this contradiction; it shapes the student to function simultaneously as a researcher—analyzing their own learning activities—and as a methodologist—designing the comprehension process for primary school pupils.

Thirdly, within international teacher education systems—specifically in advanced pedagogical education models, such as those analyzed in the research of L. Darling-Hammond[17]—the development of a research-oriented mindset and skills in "reflective practice" among prospective educators constitutes the core of their professional preparation. As D. Kuhn[16] notes, metacognitive development does not occur spontaneously; rather, it unfolds effectively within a purposefully organized, constructivist learning environment. Within the technological component of the proposed conceptual model, techniques such as "thinking aloud" and the use of metacognitive questioning serve as effective didactic tools for fostering reflective skills, even among primary-school-aged students.

The theoretical significance of this study lies in its establishment of the methodological foundations for developing the metacognitive competencies of prospective primary school teachers, presented as a cohesive system. A limitation of this work is its purely theoretical-methodological nature; evaluating the practical efficacy of the developed conceptual model and refining its associated methodological support remain tasks for future stages of research.

CONCLUSION. Based on the results of the theoretical-methodological research conducted, the following main conclusions have been reached:

1. The development of metacognitive competencies in prospective primary school teachers serves as a strategic factor for enhancing the quality of modern primary education. It enables the transition of the future educator from a mere transmitter of pre-existing knowledge into a facilitator and methodologist who manages students' cognitive processes and self-regulatory activities.

2. The concept of "metacognitive competence of a prospective primary school teacher" is defined as an integral personal-professional quality. It encompasses the educator's awareness of their own cognitive processes and learning strategies; the ability to independently plan, monitor, and adjust their professional practice; and the readiness to foster reflective thinking skills in primary-school-aged students.

3. The methodological foundation for developing metacognitive competence is formed by the integration of several approaches—systemic, competency-based, reflective-activity, constructivist, and person-centered. Furthermore, it is underpinned by principles such as conscious awareness, dual-focused metacognitive orientation, the design of a reflective environment, cognitive visualization, and the constructive overcoming of cognitive challenges.

4. The structural composition of a prospective primary school teacher’s metacognitive competence consists of the dialectical unity of metacognitive knowledge, metacognitive regulation, and reflexive-analytical and motivational-value components.

5. A conceptual-methodological model—comprising goal-methodological, content-related, technological-activity, and evaluative-outcome blocks—serves as the scientific-theoretical foundation for the systematic and purposeful development of prospective primary school teachers' metacognitive competencies within the process of higher pedagogical education.

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IMPROVING MECHANISMS FOR PROVIDING PSYCHOLOGICAL SUPPORT TO FAMILIES ON THE EDGE OF DIVORCE

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Abstract. *This article provides a theoretical and critical analysis of the issues of improving the mechanisms of psychological support for families on the verge of divorce in the Syrdarya region. The purpose of our research is to develop a comprehensive approach to developing the effectiveness of the existing system of psychological support, preventing family tensions and strengthening family cohesion. The research used analytical, psychological questionnaire, interview, observation and experimental methods. International and foreign experience (Gottman method, family systems theory, social learning theory) was analyzed. The article proposes a "Step-by-step model of psychological support" and develops practical recommendations for strengthening cooperation between state, non-governmental and public organizations, introducing family training based on the Gottman method, as well as improving the skills of specialists providing psychological support.*

Keywords: *psychological support, family on the verge of divorce, socio-psychological support, family counseling, Gottman method, family systems, Syrdarya region.*

INTRODUCTION. The family is the basic unit of society, the main environment for the preservation of national and universal values, ensuring the unity of generations, and the healthy formation of the individual[1]. However, in recent decades, globalization, socio-economic changes, and the destruction of the system of traditional values pose a serious threat to the stability of the family institution. The number of divorces in the Republic of Uzbekistan is also showing an upward trend. According to statistics, in the Syrdarya region, 6873 marriages were registered in January-December 2024, while the number of divorces was 1505[2]. These indicators indicate the need to analyze the socio-psychological environment of the region and improve the mechanisms for the rehabilitation of families on the verge of divorce. International studies show that divorce has serious psychological consequences not only for the spouses themselves, but also for children, older generations, and extended family members[3]. Although Uzbek scientists H.K. Karimov, G.B. Shoumarov, N.A. Soginov and others have comprehensively studied issues such as conflicts in Uzbek families, marital relations, and family values, there are not enough studies that comprehensively analyze the mechanisms of socio-psychological rehabilitation of families on the verge of divorce on a regional basis, in particular, on the example of the Syrdarya region[5].

METHODOLOGY. In the scientific literature, the concept of "psychological support" is understood as a process of restoring and readjusting situations arising from the conflict between the social environment and the psyche of a person, negatively affecting his life activities, relationships and health[3]. Such psychological support in the family includes the following components:

Cognitive component - eliminating misunderstanding between spouses, correcting mutual accusations and incorrect cognitive maps;

Emotional component - reducing anger, depression, anxiety, worry and emotional coldness;

Behavioral component - preventing violence, physical or psychological terror, refusal to communicate and social isolation.

Psychologist S. Minuchin's theory of family systems shows that the structure, boundaries and strong quadrangles of the family lead to increased conflicts[10]. Uzbek psychologists H.K. Karimov and G.B. Shoumarov studied the national characteristics of marital conflicts in Uzbek families, the conflict of traditional and modern values[4]. E. Gaziyev's research emphasizes that family relations are built on various foundations: economic, ideological, emotional-volitional, moral-mental, kinship, and the violation of these foundations leads to conflicts. According to the results of a study conducted in the Syrdarya region (n=200, 2024, Gulistan, Shirin, Yangiyer, Bakht, Saykhunabad districts), the current state of rehabilitation of families on the verge of divorce is as follows:

Table 1. The state of socio-psychological assistance provided to families on the verge of divorce

Indicator	Yes (%)	No (%)	Don't know (%)
Used family counseling services	12	65	23
Participated in psychological training	8	72	20
Interviewed with social services workers	18	58	24
Aware of the "Hotline" service	22	48	30
There are social barriers to accessing psychological help.	82	18	—

The data show that 65% of families on the verge of divorce are not aware of the services of family counseling centers, 72% have not participated in psychological training, and 82% noted that there are social barriers to receiving psychological help[13]. These indicators indicate that the existing rehabilitation system is not sufficiently effective. According to the Uzbekistan Statistical Agency, in the first half of 2024, 22.5 thousand divorces were registered in the republic, with the highest divorce rate observed in Tashkent city (1.9 per thousand) and Syrdarya region (1.7 per thousand)[15]. This makes Syrdarya region one of the regions with the highest divorce rate in the republic[16].

International experience uses effective methods of rehabilitation of families on the verge of divorce. The theory of "Sound Relationship House" developed by J. Gottman is a scientifically based method of divorce prevention [8]. The Gottman Method is based on the following basic principles:

Studies investigating the effectiveness of the Gottman method have shown that after 10 sessions, couples' relationships, flexibility, and intimacy improve significantly. The results of the study showed that the Gottman method was effective in increasing marital adjustment (P=0.001) and intimacy between couples (P=0.001). According to the ecological theory of child development, when the family (microsystem) is disrupted, the child's relationships with school and friends (mesosystem) are also disrupted, which negatively affects his or her overall development [6]. Therefore, family rehabilitation should be carried out not only for the couple, but also for the entire family system [10].

RESULTS AND DISCUSSION. Summarizing the results of the study, a "Step-by-step model of psychological support" is proposed for the socio-psychological rehabilitation of families on the verge of divorce in the Syrdarya region:

Table 2. "Step-by-step model of psychological support"

Stage	Content	Tasks	Methods
I. Diagnostics	Assessment of the psychological state of the family	Identifying the problem, determining its level	Socio-psychological questionnaire, interview, observation
II.Intervention	Providing psychological support	Reducing stress, restoring communication	Gottman Method, Family Systems Therapy
III.Adaptation	Family adaptation to new circumstances	Restoring mutual respect and trust	Positive communication training, role-playing
IV.Monitoring	Evaluating long-term outcomes	Relapse prevention, strengthening	Repeated request, telephone consultation

At the diagnostic stage, the V. Volkova and T. Trapeznikova marriage claim methodology is used to assess the psychological state of the family[17]. This methodology allows to determine the expectations of spouses towards each other, their role expectations. At the intervention stage, a 10-session family therapy program based on the Gottman method is introduced. Each session lasts 90 minutes and covers the following topics: creating love maps, expressing respect for each other, constructive conflict resolution, and creating a common meaning. At the adaptation stage, based on A. Bandura's social learning theory, family members learn to observe and imitate each other's positive behavior[9]. At this stage, the principles of family rituals, spending time together, and mutual support are strengthened. At the observation stage, the long-term state of the family is monitored. Based on B. Carter and M. McGoldrick's family life cycle theory, trainings are organized that are appropriate for the stages of family development[18].

CONCLUSIONS AND SUGGESTIONS. Based on the results of the study, the following conclusions were drawn:

1. In Syrdarya region, the mechanisms for providing psychological support to families on the verge of divorce are not yet sufficiently developed. 65% of families are not aware of the services of family counseling centers, and 72% are not aware of psychological training[13].

2. The main shortcomings of the existing psychological support system are social discrimination against psychological services, a shortage of specialists, and weak cooperation between the state and non-state sectors[13].

3. International experience (the Gottman method) confirms its high effectiveness in preventing divorce. After 10 sessions, relationships, flexibility, and intimacy between spouses improve significantly.

4. Family systems theory and the theory of ecological development indicate that rehabilitation should cover not only the spouses, but the entire family system and its environment[6].

5. The "step-by-step model of psychological support" (diagnosis, intervention, adaptation, monitoring) provides a comprehensive approach to families on the verge of separation.

Proposals: At the level of social policy: It is necessary to establish “Family Rehabilitation Centers” in Syrdarya region, and provide them with direct state subsidies. At least 2 family psychologists and 1 social worker should be created in each district center [2].

At the level of psychological services: It is recommended to introduce trainings based on the Gottman method, such as “The Art of Family Dialogue”, “Constructive Conflict Resolution” and “Creating Love Maps”. These trainings should be conducted free of charge at family counseling centers and cultural centers[8].

At the level of educational institutions: It is necessary to strengthen the subject of preparation for family life in schools, and to organize “Healthy Family” schools for parents [6]. Psychological trainings should be conducted for children and adolescents on how to accept family relationships[18].

At the community level: Information and explanatory work should be carried out through the media to promote family values and reduce discrimination against psychological services.[25] The “helpline” service should be expanded and the population should be informed about its work. [13]

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PSYCHOLOGICAL STATE AND SOCIAL ADAPTATION OF ADOLESCENTS RAISED IN DIVORCED FAMILIES

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Abstract. *This article analyzes the psychological state, emotional experiences, and specific features of the social adaptation process of adolescents raised in divorced families. It also highlights the factors influencing their development and outlines pedagogical and psychological support strategies.*

Keywords: *divorced family, adolescent, psychological state, social adaptation, emotional stability, stress, adaptation.*

Introduction. Today, changes in socio-economic, cultural, and spiritual factors in society significantly affect family relationships. In particular, the increasing rate of divorce has led to a growing number of children being raised in single-parent families. This, in turn, has a serious impact on the psychological development, emotional stability, and social adaptation of the younger generation.

Adolescence is one of the most complex and dynamic stages of human development, during which processes such as self-awareness, independent thinking, and the acceptance of social roles and values actively take place. The family serves as the primary environment for socialization, where a child first learns social interactions, gains emotional experience, and begins to perceive themselves as a member of society.

Main Part. The psychological state of adolescents raised in divorced families is complex and multifaceted, manifesting in various emotional and behavioral changes. First of all, such adolescents often experience internal anxiety and uncertainty. The disruption of family stability and parental separation create insecurity about the future, leading adolescents to feel vulnerable and indecisive when making important life decisions.



Emotional instability is another significant characteristic. These adolescents often display frequent mood swings, irritability, sensitivity, and sometimes depressive states. This negatively affects their relationships not only within the family but also in school and social environments.

A sense of loneliness is also common among adolescents raised in divorced families. Due to the absence of one parent or reduced attention, they may feel unnecessary or misunderstood. This can lead to withdrawal into their inner world and a decrease in social activity.

Additionally, a decline in self-confidence is a major issue. Family conflicts and the negative experiences associated with divorce adversely affect adolescents' self-esteem. As a result, they may doubt their abilities, avoid taking initiative, and struggle to express their opinions openly.

In such conditions, adolescents' behavior may also change. In some cases, they become aggressive, display rude behavior, or show a tendency toward conflict. In other cases, they exhibit passivity—withdraw from social interactions, become less communicative, and avoid activities.

Table: Psychological State and Adaptation Factors of Adolescents in Divorced Families

Factors	Negative Effects	Positive Support
Family environment	Stress, conflicts	Love and understanding
Parental attention	Lack of attention	Individual approach
School environment	Difficulty adapting	Psychological support
Peers	Isolation	Friendship and support

Research Results. Observations and analyses show that a significant proportion of adolescents raised in divorced families face psychological difficulties. In particular, about 65% of adolescents experience emotional instability, characterized by frequent mood changes, irritability, depression, and internal conflicts.

Furthermore, 48% of adolescents encounter difficulties in social adaptation. They may feel uncomfortable communicating with peers, hesitate to join groups, or struggle to find their place in society. This negatively affects their social activity and self-confidence.

In addition, 30% of adolescents were found to need psychological support. This indicates the importance of timely professional assistance in stabilizing their psychological condition and improving their social adaptation.

This study aims to investigate the psychological state and social adaptation of adolescents raised in divorced families from a contemporary psychological perspective. It is widely acknowledged that family structure plays a crucial role in shaping an adolescent's emotional stability and behavioral outcomes. In this regard, the findings suggest that adolescents from divorced families often experience challenges related to emotional regulation, self-esteem, and social competence.

From a psychological perspective, resilience and coping strategies are considered key factors that determine how successfully adolescents adapt to family changes. The data reveals that adolescents who receive consistent emotional support and guidance tend to demonstrate higher levels of psychological well-being and better social integration. Conversely, those exposed to prolonged family conflict are more likely to develop anxiety, depression, and maladaptive behavioral patterns.

Discussion

The psychological state of adolescents raised in divorced families largely depends on the quality of the family environment. The culture of interaction between parents plays a crucial role in shaping the adolescent's mental well-being. If the divorce process occurs peacefully, based on respect and understanding, the level of psychological trauma in adolescents is significantly reduced.

Conversely, intense conflicts and hostile relationships between parents can cause severe stress, anxiety, and emotional tension in adolescents. This negatively affects their mental development and may lead to long-term difficulties in social adaptation.

Therefore, it is essential to pay special attention to child upbringing in divorced families and to improve parents' pedagogical and psychological literacy. Understanding and supporting adolescents, as well as creating a healthy psychological environment, can ensure their emotional stability and successful integration into society.

Conclusion

In conclusion, the psychological state and social adaptation of adolescents raised in divorced families represent a complex and multifactorial process. Due to the sensitivity of adolescence, family changes—especially divorce—directly affect their emotional stability.

The study shows that emotional instability, anxiety, loneliness, and low self-esteem are common among such adolescents. At the same time, their social adaptation may be challenging, although with proper support, they can develop into independent and responsible individuals.

Ensuring emotional stability and improving social adaptation requires a comprehensive approach. Cooperation between family, educational institutions, and psychological services plays a crucial role. Timely psychological and pedagogical support contributes to the formation of a healthy personality and successful integration into society.

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SOCIO-PSYCHOLOGICAL CHARACTERISTICS OF YOUTH INTEREST IN THE VIRTUAL WORLD

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Abstract. *This article examines the socio-psychological characteristics of youth interest in the virtual world. In the modern era, the rapid development of information technologies, the Internet, social networks, online games, and digital platforms has made virtual environments an integral part of young people's lives. These environments influence youth worldview, behavior, communication, identity formation, cognitive processes, and social relationships. The study analyzes the psychological mechanisms of virtual engagement, including digital socialization, media influence, FOMO, dopamine-based reward mechanisms, cognitive load, multitasking effects, and digital addiction. The article also discusses major theories explaining youth behavior in virtual spaces, including social learning theory, dramaturgical theory, virtual identity theory, network society theory, and internet addiction theory. The findings show that the virtual world provides important opportunities for education, creativity, and communication, but excessive and uncontrolled use may cause addiction, anxiety, emotional detachment, and social isolation.*

Keywords: *digital socialization, media influence, psychological addiction, virtual world, youth psychology, social networks, FOMO, digital addiction.*

Introduction

Nowadays, the rapid development of information technologies has made the virtual world an inseparable part of young people's daily lives. The Internet, social networks, online games, and various digital platforms have become important spaces where youth communicate, learn, express themselves, and develop social relationships. As a result, the virtual environment has become not only a source of information but also a powerful factor influencing personality development, social behavior, value orientation, and psychological well-being.

Today's youth spend a considerable amount of time in virtual environments. This process directly affects their socialization, emotional condition, thinking patterns, and interaction with others. In this context, digital socialization has become one of the most significant processes of modern society. Digital socialization refers to the process through which individuals learn how to communicate, express opinions, build relationships, and participate in social life through online platforms.

However, the growing popularity of virtual environments also creates certain socio-psychological risks. Excessive use of the Internet and social networks may lead to psychological dependency, reduced attention span, weakened real-life communication, anxiety, and social isolation. Therefore, studying youth interest in the virtual world from a socio-psychological perspective is a relevant scientific issue.

The aim of this article is to analyze the socio-psychological factors that shape young people's interest in the virtual world and to identify both the positive opportunities and psychological risks associated with digital environments.

Methodology

This study uses a theoretical-analytical research method to examine the socio-psychological characteristics of youth interest in the virtual world. The research is based on the analysis of psychological theories, sociological concepts, and modern scientific approaches related to digital socialization, media influence, internet use, and psychological addiction.

A descriptive method is used to explain the main psychological mechanisms that influence youth behavior in virtual environments, including FOMO, dopamine-based reward systems, cognitive load, multitasking, and digital addiction. A comparative method is applied to compare the views of different scholars, such as Albert Bandura, Erving Goffman, Sherry Turkle, Jean Baudrillard, Manuel Castells, Mark Griffiths, Abraham Maslow, and Nicholas Carr.

The study also applies a socio-psychological approach to identify how virtual environments influence young people's communication, identity formation, cognitive development, emotional condition, and social relationships.

Results

The analysis shows that youth interest in the virtual world is shaped by several important socio-psychological factors. First, the virtual environment provides young people with opportunities for communication, self-expression, education, entertainment, and social participation. Through social networks, online communities, and digital platforms, youth can share ideas, access global information, and build new social connections.

Second, the virtual world strongly influences the process of digital socialization. Young people learn new forms of communication, online behavior, digital etiquette, and self-presentation through virtual interaction. In many cases, online platforms become spaces where youth develop their identity and social roles.

Third, psychological mechanisms play an important role in strengthening youth interest in the virtual world. One of the most common mechanisms is **FOMO**, or Fear of Missing Out. This phenomenon creates fear among young people that they may miss important news, events, messages, or social interactions. As a result, they feel a constant need to remain online. This may increase anxiety and reduce concentration.

Another important mechanism is the **dopamine reward system**. Likes, comments, shares, and notifications on social networks are perceived by the brain as positive rewards. Each positive signal may stimulate dopamine release, encouraging users to return to digital platforms repeatedly. Over time, this can contribute to the development of addictive behavior.

The analysis also shows that excessive virtual activity may negatively affect cognitive processes. Long-term internet use can weaken deep analytical thinking and promote superficial information processing. Nicholas Carr emphasizes that fast information exchange in the digital environment changes thinking patterns and reduces the ability to focus deeply.

In addition, several modern psychological effects are observed among young people:

- **Cognitive load** — mental fatigue caused by excessive information flow;
- **Multitasking effect** — reduced efficiency when performing several tasks at the same time;
- **Digital addiction** — the formation of uncontrolled internet or social media use;
- **Proteus effect** — the influence of virtual identity on real-life behavior.

The results also indicate that the virtual world has a dual impact on socialization. On the one hand, it expands communication opportunities and access to knowledge. On the other hand, excessive online activity may weaken real-life relationships, increase emotional detachment, and reduce direct social interaction.

Discussion

The findings suggest that youth interest in the virtual world should be understood as a complex socio-psychological process. It cannot be explained only as entertainment or simple technology use. Instead, it is connected with communication needs, identity formation, social recognition, emotional satisfaction, and psychological reward mechanisms.

Albert Bandura's social learning theory helps explain why young people imitate bloggers, influencers, media figures, and online personalities. According to this theory, behavior is formed through observation and imitation. In virtual environments, youth often observe the behavior, lifestyle, speech, and values of popular online figures and may adopt them as models.

Erving Goffman's dramaturgical approach is also relevant to virtual behavior. According to this view, individuals present themselves differently depending on the social situation. In online environments, young people often create selected versions of themselves through profile pictures, posts, stories, and comments. This shows that the virtual world becomes a stage for self-presentation.

Sherry Turkle's theory of virtual identity explains how digital platforms allow individuals to construct and experiment with different identities. This can support self-expression, but it may also create a gap between real identity and online identity.

Jean Baudrillard's idea about the disappearance of boundaries between reality and simulation is also important. In the virtual world, young people may sometimes perceive digital images, online popularity, and artificial social approval as more important than real-life experience.

Manuel Castells' network society theory explains the broader social context of virtual life. Modern society is increasingly organized through digital networks, and young people become active participants in this networked world. Therefore, the virtual environment becomes a central space for learning, communication, and social belonging.

At the same time, Mark Griffiths' internet addiction theory shows that excessive and uncontrolled use of digital platforms may result in addictive behavior. This includes constant checking of social media, inability to reduce screen time, emotional discomfort without internet access, and neglect of real-life responsibilities.

Abraham Maslow's hierarchy of needs also helps explain youth interest in the virtual world. Young people may use digital platforms to satisfy needs such as belonging, recognition, self-esteem, and self-expression. However, if these needs are met only through virtual interaction, real-life development may become limited.

Thus, the virtual world has both positive and negative effects. Moderate and purposeful use can develop visual thinking, information processing speed, creativity, and global communication skills. However, excessive use may lead to distraction, reduced deep thinking, emotional instability, dependency, and social isolation.

Conclusion

Youth interest in the virtual world is a complex socio-psychological phenomenon that affects personal development, communication, identity formation, cognitive processes, and social behavior. The virtual environment offers many opportunities for education, creativity, self-expression, and global communication. It helps young people access information quickly, participate in online communities, and develop digital skills.

However, improper and excessive use of the virtual world can create serious psychological risks. These include digital addiction, anxiety, reduced attention span, emotional detachment, weakened real-life relationships, and social isolation. Psychological mechanisms such as FOMO,

dopamine-based reward systems, cognitive load, multitasking effects, and the Proteus effect play an important role in shaping youth behavior in digital environments.

The optimal approach is not to prohibit the virtual world, but to teach young people how to use it consciously, responsibly, and in balance with real life. Parents, teachers, psychologists, and society should work together to develop a culture of responsible internet use.

The following recommendations are important:

- Develop responsible internet use among youth;
- Strengthen parental and pedagogical guidance;
- Maintain balance between real and virtual life;
- Organize psychological prevention activities;
- Teach young people critical thinking and media literacy;
- Encourage healthy communication outside digital platforms.

In conclusion, the virtual world should be used as a tool for development, education, and communication, not as a replacement for real life. Conscious and balanced use of digital technologies can support youth mental health, social development, and personal growth.

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EMOTIONAL STABILITY AND PSYCHOLOGICAL ADAPTATION OF ADOLESCENTS RAISED IN SINGLE-MOTHER FAMILIES: SPECIFIC CHARACTERISTICS

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Abstract. *This article analyzes the specific characteristics of emotional stability and the process of psychological adaptation in adolescents raised in single-mother families. The complex psychological features of adolescence, the influence of the family environment, as well as social and pedagogical factors affecting their mental development are examined. The results of the study indicate that adolescents raised in single-mother families are more likely to experience emotional instability, anxiety, and difficulties in social adaptation.*

Keywords: *single mother, adolescence, emotional stability, psychological adaptation, socialization, family environment.*

Introduction

In modern society, the increasing number of incomplete families, particularly those headed by single mothers, poses new and urgent challenges for the fields of pedagogy and psychology. Socio-economic factors, migration processes, rising divorce rates, and demographic changes have significantly increased the proportion of such families. This, in turn, directly affects adolescents' socialization, emotional development, and psychological adaptation processes.

Furthermore, the Law of the Republic of Uzbekistan "On Guarantees of the Rights of the Child" defines ensuring the comprehensive development of children, maintaining their psychological well-being, and providing social protection as key priorities of state policy. These normative-legal documents further emphasize the importance of the family, especially single-parent upbringing, in ensuring healthy psychological development of adolescents.

In addition, the Resolution of the President of the Republic of Uzbekistan No. PQ-4312 highlights the need to ensure the moral, ethical, and physical development of youth and to improve systems of psychological support. This requires strengthening pedagogical and psychological approaches aimed at developing adolescents' emotional stability.

Main Part

Adolescence is one of the most complex and responsible stages of human development. During this period, biological, psychological, and social development occurs rapidly. Adolescents strive for self-awareness, independent thinking, and determining their place in society. At this stage, their emotional sphere undergoes significant changes: emotional sensitivity increases, mood swings become frequent, and responsiveness to external influences intensifies.

At the same time, self-esteem is actively formed, and adolescents attempt to understand their abilities and personal value. The need for social interaction increases, and communication with peers becomes particularly important. However, since psychological stability is not yet fully developed, stress resistance remains relatively low, which may lead to internal and external conflicts.



Adolescents raised in single-mother families demonstrate specific developmental characteristics. Due to the absence of a father, an important social role model may be lacking. This may lead to difficulties in gender identity formation in boys and in developing relationships with the opposite sex in girls. Additionally, the mother often bears a dual responsibility—both caregiving and financial support—which can affect her psychological state.

As a result, children may receive insufficient attention or, conversely, experience excessive control. The imbalance between control and affection directly affects adolescents' emotional state and may lead to internal conflicts.

Psychological Characteristics of Adolescence

Direction	Key Characteristics	Problems	Positive Solutions
Psychology of adolescence	Increased emotional sensitivity; development of self-esteem; strong social needs	Low stress tolerance; emotional instability	Emotional support; motivation
Single-mother family factors	Mother performs dual roles; lack of role model	Lack of attention or excessive control; internal conflicts	Balance between care and control; positive communication
Emotional stability	Development of emotional regulation	Anxiety, aggression, withdrawal, depression	Psychological support; supportive environment
Psychological adaptation	Desire for socialization; peer interaction	Low self-confidence; social isolation	School and social support; group activities
Pedagogical-psychological approaches	Educational and developmental system	Inconsistent upbringing; attention issues	Training; psychological correction; individual approach

Emotional stability is an important psychological characteristic of adolescents, reflecting their ability to manage emotions, maintain balance, and respond adequately in stressful situations. Adolescents raised in single-mother families often exhibit higher levels of anxiety, which may be linked to insecurity, uncertainty about the future, and underdeveloped coping mechanisms.

Some adolescents may display aggressive behavior, while others tend toward withdrawal, reduced social activity, and isolation. Additionally, there is an increased risk of depressive moods, loneliness, and psychological distress. However, a supportive and warm family environment significantly enhances emotional stability.

Psychological adaptation refers to the successful integration of adolescents into their social environment. Adolescents from single-mother families may face difficulties in peer relationships,

often feeling different from others and experiencing self-doubt influenced by social stereotypes. This can reduce their participation in social groups and increase the risk of isolation.

Nevertheless, support from schools, teachers, psychologists, and the broader social environment can significantly ease this process. A positive communicative environment, encouragement in the learning process, and an individualized approach help strengthen adolescents' self-confidence.

Pedagogical and psychological approaches play a crucial role in enhancing emotional stability and supporting psychological adaptation. Creating a healthy psychological environment in the family, based on trust, respect, and open communication, is essential. Listening to adolescents and considering their emotions is particularly important.

Engaging adolescents in social activities such as sports, arts, clubs, and group projects promotes their socialization. Collaboration with school psychologists, psychological training, stress management programs, and emotional intelligence development activities also yield positive results. Psychocorrective work helps reduce internal conflicts and improves adaptation.

Conclusion

In general, the development of adolescents raised in single-mother families is a complex, multifaceted, and unique process. Their psychological development depends not only on individual factors but also on social, economic, and pedagogical conditions.

Such adolescents often experience emotional instability, anxiety, low self-esteem, and difficulties in social interaction, which complicates their psychological adaptation and integration into society. The absence of a father figure may also negatively affect identity formation.

However, with appropriate pedagogical and psychological approaches, a supportive environment, and coordinated efforts between family, school, and society, these challenges can be effectively addressed. This ensures the development of emotionally stable, socially adapted, and well-rounded individuals.

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COMPARATIVE ANALYSIS OF THE SOCIO-PSYCHOLOGICAL CHARACTERISTICS OF MOTHER–CHILD RELATIONSHIPS IN COMPLETE AND INCOMPLETE FAMILIES

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Abstract. *This article examines the socio-psychological characteristics of mother–child relationships in complete and incomplete families, with particular attention to adolescents' perceptions of maternal behavior and mothers' parenting attitudes. The study involved 221 respondents, including participants from complete and incomplete family contexts. Diagnostic data were processed using IBM SPSS 20, and normal distribution was tested through the Kolmogorov–Smirnov criterion. Since the data met normality requirements, Student's t-test was applied to compare group differences. The findings revealed that adolescents from incomplete families perceived lower maternal positive interest and higher directiveness and hostility than those from complete families. Mothers in complete families demonstrated stronger child acceptance, cooperation, and emotional attachment. Gender-based analysis within incomplete families showed greater maternal control toward sons and stronger symbiotic attachment toward daughters. The study concludes that family structure and gender-related dynamics significantly influence mother–child interaction, emotional support, and adolescents' socio-psychological development. These findings provide practical implications for family counselling.*

Keywords: *acceptance–rejection of the child, cooperation, symbiosis, control, attitude toward the child's failures, positive interest, directiveness, hostility, autonomy, instability, competition, collaboration, compromise, physical aggression, indirect aggression, irritability, negativism, resentment, suspiciousness, verbal aggression, sense of guilt.*

Introduction. The main issue advanced in our research is the study of the socio-psychological characteristics of mother–child relationships in incomplete families. Based on this objective, the factors influencing mother–child relationships in incomplete families are examined.

It should be emphasized that the results obtained from the diagnostic procedures aimed at studying the socio-psychological characteristics of mother–child relationships in incomplete families were entered into the IBM SPSS 20 software package, and initially the conformity of the variation series to the law of normal distribution was tested using the Kolmogorov–Smirnov criterion. According to the results of this criterion, it was determined that the participants' indicators corresponded to the normal distribution criterion. Therefore, Student's *t*-test was employed to compare the research results.

Main part. It is known that, for the purpose of scientifically investigating children's perceptions of maternal behavior, E. S. Schaefer's methodology entitled "Children's Description of Parental Behavior" was selected [4,5,6]. This methodology makes it possible to determine how maternal behavior is perceived by the child and encompasses such relationship dimensions as positive interest, directiveness, hostility, autonomy, and inconsistency. The questionnaire was

administered to the selected group of respondents, and the obtained results were analyzed both quantitatively and qualitatively and are presented in Table 1.

1-table. Differences in Children's Perceptions of Maternal Behavior Across Family Types (N = 221)

(According to Student's t-test)

Components	Family types	N	Average value	t (Student's t-test value)	p (confiden-ce level)
Positive Interest	Complete Family	120	12,68	2,195	p≤0,05
	Incomplete Family	101	8,42		
Directiveness	Complete Family	120	9,94	-4,618	p≤0,01
	Incomplete Family	101	13,56		
Hostility	Complete Family	120	9,29	-2,124	p≤0,05
	Incomplete Family	101	12,50		
Autonomy	Complete Family	120	8,37	1,496	p>0,05
	Incomplete Family	101	6,96		
Instability	Complete Family	120	9,92	0,961	p>0,05
	Incomplete Family	101	8,93		

According to the results presented in Table 1, when the psychological characteristics of children's perceptions of maternal behavior were examined across family types, statistically significant differences were identified in the positive interest component ($t = 2.195$; $p \leq 0.05$).This indicates that adolescents raised in complete families, compared to those raised in incomplete families, tend to evaluate their mothers' attitudes toward them as being at a normative level; that is, mothers are more often perceived as consistently attentive, caring, open in their interactions while taking their children's wishes into account, and positively accepting their opinions and views. This suggests that adolescents raised in incomplete families are more likely to perceive their mothers' attitudes toward them as limited, particularly characterized by emotional coldness, a low level of emotional support, and a tendency to avoid communication.

When the respondents' indicators regarding the manifestation of directiveness were compared, statistically significant differences were identified between the groups ($t = -4.618$; $p \leq 0.01$). This can be explained by the fact that attempts by mothers to induce feelings of guilt in their children, maintain constant control over them, negatively perceive their children's personal opinions, consider themselves always right, and resolve interpersonal problems through punishment are observed more frequently among adolescents raised in incomplete families than among those raised in complete families. Thus, in incomplete families, mother–child relationships are more often characterized by control-based interactions, emotional pressure, and restrictions on personal freedom, which may negatively affect psychological processes such as independent thinking, initiative, and social adaptation.

When the respondents' indicators regarding the manifestation of hostility were examined, statistically significant differences were identified (t = -2.124; $p \leq 0.05$). These findings indicate that behaviors such as mothers displaying aggressive attitudes toward their children, excessive strictness, attempts to dominate or "defeat" the child as a rival, suspicious attitudes toward the child accompanied by emotional coldness, and critical or harsh interactions with the child are observed more frequently among adolescents raised in incomplete families than among those raised in complete families. The results suggest that, in incomplete families, the increasing family burden placed on mothers—where they assume not only child-rearing responsibilities but also financial and social obligations alone—contributes to greater emotional exhaustion, irritability, and tendencies toward harshness.

It should be noted that, during the course of the study, no statistically significant differences were observed in the autonomy and instability components when examining differences in children's perceptions of maternal behavior across family types. This suggests that such characteristics of family relationships as suppressing the child's wishes, indifference or inattentiveness to the child's problems, as well as inconsistent attitudes toward the child—simultaneously displaying strength and caution, distrust and suspicion—do not differ fundamentally between complete and incomplete families.

While the above section provided a general analysis of the differences in children's perceptions of maternal behavior across family types, the following section separately examines differences in mothers' attitudes toward their children within the context of family type. The indicators obtained from mothers raising children in complete and incomplete families, based on A. Ya. Varga and V. V. Stolin's methodology entitled "Parents' attitude towards children" are presented in Table 2 [1,2,3].

2-table. Differences in Mothers' Attitudes Toward Their Children Across Family Types (N = 221)

(According to Student's t-test)

Components	Family types	N	Average value	t (Student's t-test value)	p (confiden-ce level)
Acceptance of the Child	Complete Family	120	10,35	2,251	p≤0,05
	Incomplete Family	101	7,56		
Cooperation	Complete Family	120	9,57	2,601	p≤0,01
	Incomplete Family	101	5,87		
Symbiosis	Complete Family	120	8,80	2,806	p≤0,01
	Incomplete Family	101	5,77		
Control	Complete Family	120	4,11	0,145	p>0,05
	Incomplete Family	101	4,06		
Attitude Toward the Child's Failures	Complete Family	120	3,25	-0,664	p>0,05
	Incomplete	101	3,54		

	Family				

According to the results presented in Table 2, statistically significant differences were identified in the child acceptance component among mothers raising children in complete and incomplete families (t = 2.251; $p \leq 0.05$). These indicators suggest that emotional support in interactions with the child, expressions of affection and care, trust based on friendly relationships, acceptance of the child as they are, positive attitudes toward independent thinking, and efforts to understand and consider the child's needs were observed more frequently in complete families than in incomplete families. Therefore, the lower manifestation of this component in incomplete families may be explained by the fact that mothers are often under economic and social pressures, leading to stress and consequently weakening the emotional bond between mother and child.

When the respondents' indicators regarding the manifestation of cooperation were examined, statistically significant differences were identified (t = -2.601; $p \leq 0.01$). This can be explained by the fact that mothers in complete families, compared to mothers in incomplete families, more frequently demonstrate trust and encourage independence in responsible tasks, listen to and consider their children's opinions, apply guidance-oriented rather than punishment-based management, and respect their children as individuals. These findings indicate that mothers raising children in incomplete families are more inclined toward authoritarian and control-based parenting styles, that is, a directive approach.

When the respondents' research results regarding the symbiosis component were compared, statistically significant differences were identified in this factor (t = -2.806; $p \leq 0.01$). The findings indicate that mothers raising children in complete families, compared to those in incomplete families, demonstrate a deeper level of emotional attachment in their relationships with their children, greater care and concern for them, stronger efforts to maintain supportive and positive interactions, and a greater tendency to provide their children with a sense of dignity, security, and protection.

It should be emphasized that, during the course of the study, no statistically significant differences were identified between mothers raising children in complete and incomplete families with regard to the manifestation of control and attitudes toward children's failures. This indicates that the management of children's behavior, the authoritarian or democratic nature of parenting styles, respect for children's opinions and emotions, as well as attitudes toward children's abilities, shortcomings, successes, and failures do not differ fundamentally across family types.

In addition, based on these methodologies, children's perceptions of maternal behavior in incomplete families were examined separately according to gender, and the results are presented in Table 3.

3-table. Differences in Children's Perceptions of Maternal Behavior in Incomplete Families Across Gender Categories (N = 101)

(According to Student's t-test)

Components	Gender types	N	Average value	t (Student's t-test value)	p (confidence level)
Acceptance of the Child	Boys	52	9,44	1,195	p>0,05
	Girls	49	9,42		
Cooperation	Boys	52	8,94	-1,618	p>0,05

	Girls	49	8,96		
Symbiosis	Boys	52	9,29	-1,122	p>0,05
	Girls	49	9,31		
Control	Boys	52	12,37	2,493	p≤0,05
	Girls	49	6,96		
Attitude Toward the Child's Failures	Boys	52	7,17	0,988	p>0,05
	Girls	49	7,05		

According to the results presented in Table 3, when the respondents' results for the positive interest component were compared, no statistically significant differences were identified in this factor (t = 1.195; p > 0.05). These findings indicate that adolescent girls and boys raised in incomplete families do not differ substantially in their perceptions of their mothers' critical attitudes, positive interest, consistent attention, care, and willingness to fulfill their children's wishes and needs. The research results further demonstrated that children's descriptions of maternal behavior among both boys and girls are not determined by gender.

When the respondents' results regarding the manifestation of the directiveness component were examined, no statistically significant differences were identified between the indicators (t = -1.618; p > 0.05). This suggests that, in incomplete families, children's identification of maternal behaviors—such as mothers perceiving themselves as sacrificing their lives for their children, asserting their authority to prevent children from making mistakes, and resolving problems through punishment—is similarly observed across gender categories.

When the respondents' results regarding the hostility component were analyzed, no statistically significant differences were identified among these indicators (t = -1.122; p > 0.05). This suggests that, in incomplete families, boys and girls raised by their mothers do not differ significantly in perceiving maternal behavior as characterized by suspicious attitudes that create emotional distance, manifestations of physical and verbal aggression, excessively critical interactions, and tendencies to withdraw from their children.

When the respondents' indicators regarding the manifestation of autonomy were compared, statistically significant differences were identified between the groups (t = 2.493; $p \leq 0.05$). The findings indicate that adolescent boys and girls raised in incomplete families differ in their descriptions of maternal behavior, with boys more frequently perceiving their mothers as failing to accept them as individuals, subordinating their wishes to maternal goals, and displaying indifference toward their problems compared to girls.

No statistically significant differences were identified between the respondents' results regarding the instability component (t = 0.988; p > 0.05). The research findings indicate that there are no substantial differences between boys and girls raised by single mothers in incomplete families with respect to this indicator. This suggests that the level of instability in relationships among children growing up in incomplete families does not differ significantly according to gender characteristics.

Furthermore, based on these methodologies, differences in mothers' attitudes toward their children in incomplete families were examined across gender categories, and the results are presented in Table 4.

According to the results presented in Table 4, when the respondents' results regarding the symbiosis component were compared, statistically significant differences were identified in this factor (t = -2.724; $p \leq 0.01$). The findings indicate that mothers in incomplete families are more

likely to seek emotional and social closeness, companionship, friendship, and emotional support from their daughters than from their sons. This situation demonstrates the existence of significant differences in mothers' attitudes toward daughters compared to sons.

4-table. Differences in Mothers' Attitudes Toward Their Children in Incomplete Families Across Gender Categories (N = 101)

(According to Student's t-test)

Components	Gender types	N	Average value	t (Student's t-test value)	p (confiden -ce level)
Acceptance of the Child	O'g'il bolalar	52	8,42	1,048	p>0,05
	Qiz bolalar	49	7,78		
Cooperation	O'g'il bolalar	52	5,37	-0,552	p>0,05
	Qiz bolalar	49	6,83		
Symbiosis	O'g'il bolalar	52	7,80	-2,724	p≤0,01
	Qiz bolalar	49	11,24		
Control	O'g'il bolalar	52	10,14	2,145	p≤0,05
	Qiz bolalar	49	6,08		
Attitude Toward the Child's Failures	O'g'il bolalar	52	7,48	-0,955	p>0,05
	Qiz bolalar	49	7,59		

When the results concerning mothers' attitudes toward their children in relation to the control component were comparatively examined, statistically significant differences were identified between the groups (t = 2.145; $p \leq 0.05$). Based on these indicators, it should be emphasized that mothers raising children in incomplete families tend to exercise stronger control over their sons than over their daughters, more frequently applying boundaries, restrictions, punishment mechanisms, and authoritarian or democratic parenting approaches. Furthermore, these differences may serve as a methodological basis for developing recommendations regarding mother–child relationships within the framework of this study through a deeper examination of parenting styles in incomplete families.

The results revealed that, during the course of the study, no statistically significant differences were observed in mothers' attitudes toward their children in incomplete families with regard to child acceptance, cooperation, and attitudes toward children's failures. This suggests that mothers raising children in incomplete families demonstrate similar levels of emotional acceptance, emotional support in various situations, willingness to cooperate in performing certain tasks, and attitudes toward their children's achievements and shortcomings across gender categories.

Conclusion. Based on the above indicators, it can be emphasized that family type and gender-related dynamics within the family negatively influence interpersonal relationships between mothers and adolescent children in both complete and incomplete families. In particular, the absence of a father figure or insufficient emotional support in incomplete families adversely affects adolescents' socio-psychological development.

In conclusion, it can be stated that the instability of family structure, mothers' parenting approaches, the level of attention given to children, and the degree of emotional support directly influence the quality of interpersonal relationships. The way adolescent children feel in

communication with their mothers is directly associated with their self-esteem, social relationships, and future patterns of behavior.

While this section presented analyses of mothers' relationships with their children and children's perceptions of maternal behavior across family types and gender categories in complete and incomplete families, the following paragraph examines the characteristics of the interrelationship between mother–child relations in incomplete families.

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THE CONCEPT OF EPISTEMIC THINKING AND ITS SCIENTIFIC INTERPRETATIONS

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Abstract. *This thesis is aimed at a systematic analysis of the concept of epistemic thinking within the framework of modern psychology and philosophy of science based on various approaches. The main goal of the study is to clarify the important structural features of epistemic thinking related to cognitive processes, criteria for substantiating evidence and mechanisms for proving knowledge, as well as diagnostic indicators that serve to identify them. Methodologically, the work uses conceptual analysis, comparative commentary, and approaches to expressing psychological constructs through specific indicators (operationalization). The scientific novelty of the study is that it interprets epistemic thinking as a holistic system that includes metacognitive control, epistemic beliefs, and sensitivity to evidence. Also, the criteria for evaluating scientific thinking are justified on the basis of the proposed model, in harmony with national scientific traditions.*

Keywords: *epistemic thinking; epistemic beliefs; metacognition; reasoning; scientific thinking; substantiating knowledge; critical evaluation.*

INTRODUCTION

The term epistemic thinking was formed in the scientific literature at the intersection of two major directions: on the one hand, within the framework of cognitive theory and philosophy of science, the validity of knowledge, criteria of truth, evidence and explanatory relationships are discussed; on the other hand, within the framework of cognitive and developmental psychology, it is interpreted as an empirically measurable construct of a person’s attitude to knowledge, perceptions of the sources of knowledge, the ability to reconsider beliefs and sensitivity to evidence. For this reason, epistemic thinking is not equated with simple “knowing a lot” or “smart thinking”: it is a set of normative and psychological mechanisms related to how knowledge is formed, under what conditions it is considered justified, how to choose between competing claims and how to manage thought in conditions of uncertainty. This article substantiates the need for a conceptual model that combines the psychology of scientific thinking, metacognitive regulation, culture of evidence and psychological factors of knowledge justification.

REVIEW OF RELATED LITERATURE

Thinking is a special function of the human brain. Its neurophysiological basis is the interaction of the first and second signal systems. In the process of thinking, thoughts, reasoning, ideas, hypotheses, etc. arise in a person, and they are expressed in the person's mind in the form of concepts, judgments, and conclusions. Thinking is closely related to language and speech. Thinking activity is manifested in the form of speech. In the process of speech communication, a person's emotional perception is not only expanded, but the acquired experience is also transferred to other people. A person is distinguished from other creatures by his thinking, speech and conscious behavior. In the process of thinking, he determines the reality of the things and phenomena he reflects, perceives, and imagines, and determines whether the judgments, concepts,

and conclusions he draws are true or false. Through thinking, a person directly reflects reality by generalizing, comprehending the most important connections, relationships, and properties between things and phenomena. Therefore, a person has the opportunity to foresee the emergence, development, and consequences of social events and phenomena based on certain laws, regulations, and rules.

Another important line in epistemic thinking interpretations is related to “dual-process” approaches. While fast intuitive thinking is often effective in everyday life, it can increase errors in scientific reasoning; slow, analytical thinking supports evidence-based scrutiny. Individuals with high epistemic thinking are usually better able to distinguish when to rely on intuitive inferences and when to activate analytical scrutiny, that is, they have “cognitive flexibility.”

In scientific interpretations of epistemic thinking, the distinction between “epistemic rationality” and “instrumental rationality” introduces an important methodological clarification. While instrumental rationality focuses on choosing the most effective means to achieve a goal, epistemic rationality is determined by the truthfulness of beliefs and their correspondence to evidence.

The international literature particularly emphasizes the links between scientific thinking and argumentation: assessing the quality of evidence, inferring the "best explanation," and testing theoretical models are central mechanisms of epistemic thinking.

RESEARCH METHODOLOGY

The issue of operationalizing epistemic thinking for empirical research requires a separate discussion. Many measures rely on epistemic belief questionnaires, scientific reasoning tests, argumentation tasks, source evaluation tasks, and metacognitive monitoring indicators. However, within the framework of the OAC requirements, the theoretical thesis must also demonstrate the scientific validity of the diagnostic criteria: which component of epistemic thinking the measures reflect, how much they differ from each other, and how the results depend on the context. For example, simply answering test questions correctly does not guarantee high epistemic thinking, as this may be the result of knowledge or training; on the contrary, consistency in the selection of evidence, consideration of counter-evidence, and the ability to draw conclusions Process indicators such as indicating the limitations of the source, and the strategy of checking the source more accurately capture the epistemic quality. Epistemic thinking can also be more clearly manifested in socio-cognitive situations, for example, in the process of scientific discussion or evaluating expert opinions, which increases the requirements for task design.

Today, the rapid increase in the volume of information in society requires a person not only to acquire knowledge, but also to acquire the skills of critical analysis, evaluation and justification. Therefore, epistemic thinking is considered one of the important and relevant issues in scientific research. Epistemic thinking expresses the level of understanding of a person's views on knowledge, its source, reliability and methods of justification.

This concept was formed at the junction of the disciplines of pedagogy, psychology and philosophy and serves to provide a deeper understanding of the process of acquiring knowledge. In particular, the widespread introduction of a competency-based approach in the education system further enhances the importance of epistemic thinking.

ANALYSIS AND RESULTS

Epistemic thinking is a type of thinking that describes how a person creates, justifies, and evaluates knowledge, and is studied within the framework of Epistemology. This concept reflects a person's attitude to questions such as "what is knowledge?", "where does it come from?", "how

reliable is it considered?" Epistemic thinking represents the reflexive (self-analytical) aspect of cognitive processes and occupies an important place in modern psychology and educational theory.

An integrative definition of the psychology of epistemic thinking can be proposed: epistemic thinking is a coherent system of cognitive-operational processes, metacognitive control mechanisms, and epistemic beliefs that enable an individual to develop, evaluate, justify, and, if necessary, revise knowledge claims based on evidence and norms. The scientific advantage of this definition is that it does not reduce epistemic thinking to a single indicator and allows for the construction of a multidimensional model in empirical research. It also connects the normative requirements of the philosophy of science with psychological reality: such requirements as fidelity to evidence, testability, error recognition, and working with probability are realized in individual thinking through metacognitive regulation.

The results obtained show that epistemic thinking is not only a theoretical concept, but also has an important role in the process of practical education. In particular,

- problem-based learning,
- interactive methods,
- research-oriented activities

are effective in developing epistemic thinking.

The competency-based approach in modern education serves precisely the development of epistemic thinking. Because this approach forms the skills of understanding and applying knowledge in students, not just memorizing it.

CONCLUSIONS AND ANALYSIS

Epistemic thinking is a culture of understanding human cognitive activity. It ensures the transition of a person from simple (absolute) views to complex, critical and analytical (evaluative) views, which serves as the basis for drawing correct conclusions in the modern information space. In conclusion, epistemic thinking appears in scientific interpretations as a central construct that unites the normative and psychological foundations of cognitive processes. It provides an attitude to the nature of knowledge through epistemic beliefs, control and correction of thought through metacognition, and the connection of evidence and conclusion through argumentation. The proposed integrative approach indicates the need to rely on the process of reasoning and sensitivity to evidence when assessing epistemic thinking, not on the result; this serves as a theoretical foundation for the development of scientific thinking, strengthening critical analysis in education, and conscious mastery of research methodology. Viewing epistemic thinking in a three-level model explains the coherence of cognitive operations, metacognitive control, and epistemic norms, and paves the way for the development of more precise diagnostic criteria in psychological research.

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FACTORS INFLUENCING CHILDREN'S CHEATING BEHAVIOR AND APPROACHES TO PROMOTE EARLY HONESTY

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Abstract. *Honesty, as a core moral trait, lays the foundation for children's social adaptation, interpersonal relationships, and long-term psychological development. In early childhood (3–8 years old), children's moral cognition and behavioral control are in a critical period of formation, and cheating behavior often occurs in daily learning, games, and social interactions. This review systematically collates and analyzes relevant published literatures on child education and early honesty development, focusing on two core issues: the factors influencing children's cheating behavior and the effective approaches to promote early honesty. The influencing factors are categorized into individual internal factors (cognitive development, temperament, moral emotion) and external environmental factors (family upbringing, peer interaction, school education, media influence). The promotion approaches are summarized from the perspectives of family education, school intervention, peer guidance, and multi-environmental synergy, and their effectiveness, applicable scenarios, and existing limitations are discussed. In addition, this review presents the research status, existing gaps, and future research directions in this field, providing theoretical support and practical guidance for educators, parents, and researchers to cultivate children's honesty in early life.*

Keywords: *early Childhood; Cheating Behavior; Honesty Development; Influencing Factors; Intervention Approaches.*

Introduction

Honesty is an essential moral virtue that runs through the entire process of human social development, and its formation begins in early childhood. Early childhood is a critical period for the development of moral judgment, moral emotion, and self-regulation ability. During this period, children's understanding of honesty and dishonesty is gradually formed, and their cheating behavior, as a typical manifestation of dishonesty, often appears in various scenarios, such as copying answers in learning activities, lying about their behavior to avoid punishment, or cheating in games to gain advantages. Although occasional cheating behavior in early childhood is a normal phenomenon in the process of moral development, long-term or frequent cheating will not only affect children's self-cognition and academic development but also damage their interpersonal trust and social reputation, laying hidden dangers for their moral development in adolescence and adulthood (Yu et al., 2025). Therefore, exploring the factors influencing children's cheating behavior and exploring effective approaches to promote early honesty are important topics in the field of child education and moral development.

In recent years, scholars at home and abroad have conducted a large number of empirical studies on children's cheating behavior and honesty development, covering different age groups, cultural backgrounds, and research scenarios, and have obtained rich research results. For example, some studies have focused on the cognitive mechanism of children's cheating behavior, exploring the relationship between theory of mind, inhibitory control, and cheating tendency (Yu et al., 2025); some studies have examined the impact of emotional factors (such as moral pride, adult emotional reactions) on children's honesty (Ma et al., 2025; Zhao et al., 2025); others have explored the effectiveness of intervention approaches such as moral stories, trust induction, and self-efficacy feedback in promoting children's honesty (Sai et al., 2025; Zhao et al., 2024a; Zheng et al., 2024). However, existing studies are mostly focused on a single influencing factor or intervention approach, and there is a lack of systematic collation and analysis of the overall research results, making it difficult to fully grasp the research context and development trend of this field.

Based on recently published related literatures (2023–2026), this review systematically sorts out the factors influencing children's cheating behavior and the effective approaches to promote early honesty, discusses the internal mechanism and external conditions of children's honesty development, points out the existing research gaps, and puts forward future research directions. This review aims to integrate the latest research results, provide a comprehensive theoretical framework for the study of children's honesty development, and provide practical guidance for parents and educators to carry out honesty education in early childhood.

Factors influencing children's cheating behavior

Children's cheating behavior is not an isolated phenomenon but is jointly affected by individual internal factors and external environmental factors. The interaction between these two types of factors determines the occurrence, frequency, and persistence of children's cheating behavior. The following will combine the collected literatures to analyze the specific influencing factors from two aspects: individual internal factors and external environmental factors.

Individual internal factors

Individual internal factors refer to the inherent characteristics of children themselves, including cognitive development level, moral emotion, self-efficacy, and empathy ability, which directly affect children's judgment and choice of cheating behavior. These factors are the internal basis for children's cheating behavior and play a decisive role in the formation and development of their moral behavior.

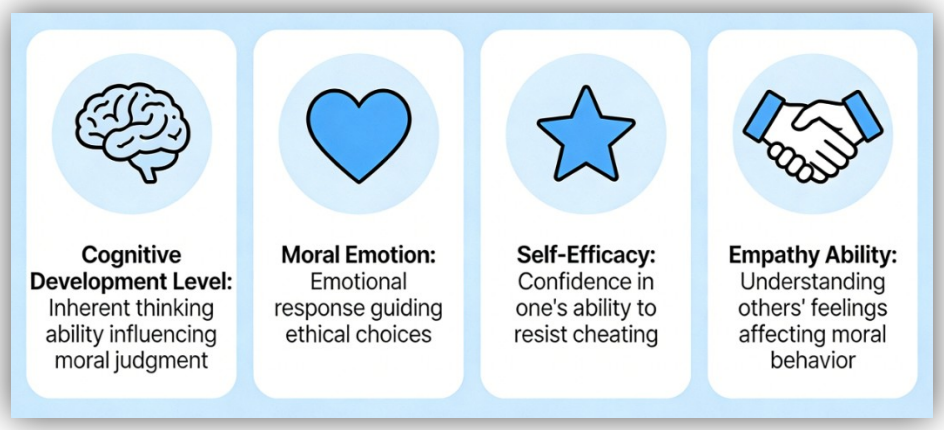


Figure 1. Individual internal factors affecting children`s cheating behavior.

Cognitive development is an important prerequisite for children's moral behavior, and there is a close relationship between children's cognitive ability and cheating behavior. The development of theory of mind, inhibitory control, free will belief, and other cognitive abilities directly affects children's understanding of cheating and their ability to control cheating behavior (Yu et al., 2025). Yu et al. (2025) conducted a longitudinal study on 100 children aged 3-6 years, and the results showed that children's cheating tendency was stable over a one-year period, and cognitive factors such as theory of mind and inhibitory control were significantly correlated with children's cheating behavior. Specifically, children with better theory of mind and stronger inhibitory control were less likely to cheat, because they could better understand the negative consequences of cheating and better control their impulsive behavior of cheating.

In addition, the cognitive understanding of deception and permission also affects children's cheating behavior. Chadmen et al. (2026) conducted three studies on 279 Singaporean children aged 36–83 months, and found a "permission paradox": when children were explicitly given permission to deceive in a strategic game, they were less likely to deceive, rather than more likely as hypothesized. This shows that even in contexts where ethical guidelines are presumed to be suspended, children's moral considerations still persist, and the cognitive and moral aspects of deception are deeply intertwined during early development. This finding challenges the traditional assumption that games requiring deception can effectively isolate cognitive aspects from sociomoral considerations, indicating that children's cognitive understanding of deception is closely linked to their moral judgment.

Another important cognitive factor is children's default tendency towards honesty. Meng et al. (2026) tested the default tendencies of 439 Han Chinese children aged 8–15 years using a spot-the-difference paradigm, and found that there were individual differences in children's default tendencies towards honesty, which were closely linked to their lying rates. In addition, social comparison information could systematically affect children's lying rates and default tendencies within individuals, showing inter- and intra-individual flexibility in children's default tendencies. This indicates that children's cognitive default towards honesty is not fixed but can be adjusted according to external information, which also affects their cheating behavior in different scenarios.

Moral emotion is an important driving force for children's moral behavior, and positive moral emotions (such as moral pride) can effectively promote children's honest behavior, while the lack of moral emotion may lead to the occurrence of cheating behavior. Ma et al. (2025) conducted a study on 247 Chinese preschool children aged 3–6 years using a temptation resistance paradigm, and found that children in the moral pride condition were significantly less likely to lie about peeking than those in the nonmoral pride, happiness, and baseline conditions. The nonmoral pride and happiness conditions did not differ in lying rates from the baseline condition, indicating that moral pride, rather than general positive emotions, can enhance children's honesty. This is because moral pride is closely linked to children's moral behavior, which can make children feel a sense of accomplishment and pride from honest behavior, thereby reducing their tendency to cheat.

In addition, children's perception of others' emotional reactions also affects their cheating behavior. Zhao et al. (2025) conducted five preregistered studies on 480 Chinese children aged 3-6 years, and found that telling 5–6-year-olds about a familiar adult's (homeroom teacher or mother) negative emotional reactions to their future dishonesty significantly reduced their subsequent cheating. For 3–4-year-olds, telling them about their mother's positive reactions to honesty or negative reactions to dishonesty also reduced their cheating. This shows that children's perception

of adults' emotional expectations and reactions can regulate their own moral behavior, and the emotional information from familiar adults has a significant impact on children's honesty.

Self-efficacy refers to an individual's belief in their ability to complete a certain task, which also affects children's cheating behavior. Zhao et al. (2024b) conducted three preregistered studies on 5–6-year-old children, and found that general self-efficacy and task-specific self-efficacy were not directly associated with children's cheating behavior. However, when children received brief positive feedback on task-specific self-efficacy, their cheating behavior was significantly reduced compared to the control group that received no feedback. This finding indicates that although self-efficacy itself does not directly affect children's cheating, positive feedback on self-efficacy can enhance children's confidence in completing tasks, thereby reducing their tendency to cheat to obtain success.

Empathy ability, especially cognitive empathy, is also an important factor affecting children's cheating behavior. Hecker et al. (2024) conducted two experiments on 274 participants aged 10–16 years, and found that cognitive empathy (measured by the fantasy scale) was associated with less deception of another player when the other player was not identified (only referred to as "Player B"). However, when the other player was identified by name, empathy did not predict deception, and the only factors affecting deception were self-interest and social norms. This shows that cognitive empathy can promote children's honesty by enhancing their understanding of others' feelings and interests, but this effect is affected by the familiarity and identification of the other party.

External environmental factors

External environmental factors refer to the various environments and stimuli that children come into contact with in their growth process, including family environment, school environment, peer interaction, and social cognition. These factors interact with individual internal factors to jointly shape children's cheating behavior and honesty development.

Trust is an important social factor affecting children's honesty. Zhao et al. (2024a) conducted five studies on 328 kindergarten children (mean age 5.94 years), and found that children who were trusted by adults to help with a task cheated less than children who were not trusted. This study provides clear evidence for the causal effect of trust on honesty, indicating that trusting young children can enhance their sense of responsibility and moral awareness, thereby reducing their cheating behavior. This finding also suggests that adult trust is an effective method to promote children's honesty in early childhood.

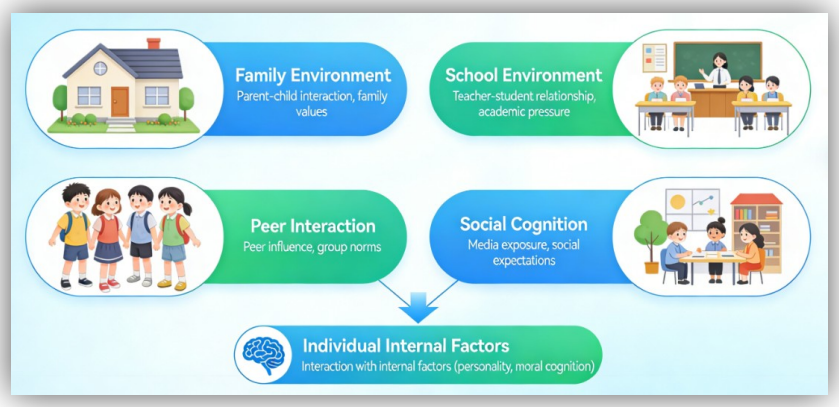


Figure 2. External environmental factors affecting children`s cheating behavior and honesty development.

Table 1. Key literatures on factors influencing children's cheating behavior.

Literature	Research Object	Key Influencing Factor	Core Finding
Chadmen et al. (2026)	36–83-month-old Singaporean children (N=279)	Cognitive understanding of permission and deception	Children were less likely to deceive when explicitly given permission to deceive (permission paradox).
Meng et al. (2026)	8–15-year-old Han Chinese children (N=439)	Default tendency towards honesty	There are inter- and intra-individual differences in default tendencies, which are linked to lying rates; social comparison affects default tendencies.
Ma et al. (2025)	3–6-year-old Chinese children (N=247)	Moral pride	Moral pride significantly reduces children's lying behavior; nonmoral pride and happiness have no effect.
Yu et al. (2025)	3–6-year-old children (N=100)	Cognitive factors (theory of mind, inhibitory control, free will belief)	Children's cheating tendency is stable over 1 year; cognitive factors are correlated with cheating behavior.
Zhao et al. (2025)	3–6-year-old Chinese children (N=480)	Adults' emotional reactions	Telling children about familiar adults' emotional reactions to honesty/dishonesty reduces cheating.
Hecker et al. (2024)	10–16-year-old participants (N=274)	Cognitive empathy	Cognitive empathy reduces deception towards unfamiliar peers; no effect towards identified peers.
Zhao et al. (2024a)	Kindergarten children (mean age 5.94 years, N=328)	Adult trust	Children who are trusted cheat less than those who are not trusted.
Zhao et al. (2024b)	5–6-year-old children	Self-efficacy feedback	Positive feedback on task-specific self-efficacy reduces cheating.
Zheng et al. (2024)	5-year-old children	Consistency of cheating/honesty	High consistency in cheating and honesty; integrity intervention helps maintain honesty in initially honest children.

School is an important place for children's moral education, and school education methods and intervention measures have a significant impact on children's cheating behavior and honesty development. Moral stories are a common method used by educators to promote children's

honesty, but their effectiveness varies with the type of story. Sai et al. (2025) conducted a study on 208 Chinese preschool children, and found that children in the positive moral story condition were more likely to tell the truth than those in the control condition, while negative moral stories did not have this effect. In addition, combining external appeals with positive moral stories was equally as effective as positive moral stories alone.

Liang et al. (2025) further explored the influence of different types of moral stories on children's honest behavior through a field experiment on children aged 7–11 years. The results showed that moral stories with positive consequences of honesty significantly promoted children's honest behavior and suppressed their tendency to lie compared to the control condition. Moreover, the impact of such stories varied with age: they significantly promoted the honest behavior of children aged 7–10 years, but the effect on 11-year-old children was not significant. The reason is that positive moral stories convey encouraging messages that "speaking the truth leads to positive consequences", which is more in line with the cognitive level and psychological needs of younger children.

In addition, school intervention measures also affect children's cheating behavior. Zheng et al. (2024) conducted three preregistered studies on 5-year-old children, and found high consistency in both honesty and cheating: all children who cheated on the first test continued cheating on subsequent tests, with shorter cheating latencies over time; 77% of initially honest children-maintained honesty despite repeated failure. A brief integrity intervention helped initially honest children remain honest but failed to dissuade initially cheating children from cheating. This indicates that early prevention of cheating is more effective than remedying it after it occurs, and school intervention should focus on fostering honesty in children from the start.

Adults' evaluation and perception of children's honest and dishonest behavior also affect children's cheating behavior. Brimbal et al. (2023) investigated how adults evaluate children's truths and lies across various situations, and found that blunt truth-tellers were judged most negatively when compared to liars and subtle truth-tellers, but only for polite lies. For protective scenarios, directness was not as influential. In addition, adults were more likely to reward subtle truth-telling. This shows that adults deliver mixed messages to children about the acceptability of truth- and lie-telling across contexts, which may confuse children's moral judgment and affect their cheating behavior.

O'Connor et al. (2025) explored adults' implicit and explicit biases towards children's honesty, and found that only women were implicitly biased to associate honest words with children over adults, but both men and women held a child-honesty bias at the explicit level, and this remained stable across younger and older adults. This implicit bias may affect how adults interact with children and how they respond to children's disclosures, thereby indirectly affecting children's honesty development.

Approaches to promote early honesty

Based on the factors influencing children's cheating behavior, scholars have explored a variety of approaches to promote early honesty, covering family education, school intervention, peer guidance, and multi-environmental synergy. These approaches are targeted at different influencing factors and have their own characteristics and applicable scenarios. The following will combine the collected literatures to sort out and analyze these approaches.

Family education approaches

Family is the first place for children's moral education, and family education plays a fundamental role in promoting children's honesty. Based on the collected literatures, family

education approaches to promote children's honesty mainly include two aspects: inducing moral pride and conveying emotional expectations.

First, fostering moral pride in children. Ma et al. (2025) found that inducing moral pride in preschoolers through a compliance task can significantly reduce their lying behavior. Therefore, parents can cultivate children's moral pride by praising their honest behavior, letting them realize the value and significance of honesty, and making them feel proud of their honest behavior. For example, when a child takes the initiative to admit their mistake, parents should timely affirm and praise them, emphasizing that honesty is a precious virtue, so as to enhance the child's sense of moral pride and strengthen their honest behavior. Second, conveying clear emotional expectations. Zhao et al. (2025) found that telling young children about a familiar adult's (especially mother's) emotional reactions to their future honesty or dishonesty can effectively reduce their cheating behavior. Therefore, parents should clearly express their emotional attitudes towards honesty and dishonesty to their children, let them know that parents will be happy for their honest behavior and disappointed for their dishonest behavior, and guide children to choose honest behavior through emotional cues.

In addition, parents should also establish a trusting relationship with their children. Zhao et al. (2024a) found that trusting children to help can cause them to cheat less. Therefore, parents should give children appropriate trust, let them participate in family affairs, and let them feel their own responsibility and value, so as to enhance their moral awareness and reduce their tendency to cheat.

School intervention approaches

School is an important position for children's honesty education, and school intervention approaches are more systematic and targeted. Based on the collected literatures, school intervention approaches mainly include moral story education, self-efficacy feedback, integrity intervention, and creating a trusting environment.

Moral stories are an effective way to promote children's honesty, but it is necessary to choose appropriate types of stories. Sai et al. (2025) and Liang et al. (2025) both found that positive moral stories (with positive consequences of honesty) can significantly promote children's honest behavior, while negative moral stories have no obvious effect. Therefore, teachers should use positive moral stories more frequently in daily teaching, such as stories about children who gain praise and respect because of their honesty, to convey positive messages to children and guide them to imitate honest behavior.

In addition, Liang et al. (2025) found that the effect of positive moral stories varies with age, and they are more effective for children aged 7–10 years. Therefore, teachers should choose moral stories suitable for children of different ages according to their cognitive level and psychological characteristics, so as to improve the effectiveness of story education. For example, for preschool children, simple and vivid picture books about honesty can be used; for school-age children, stories with more complex plots and obvious moral implications can be used.

Zhao et al. (2024b) found that positive feedback on children's task-specific self-efficacy can significantly reduce their cheating behavior. Therefore, teachers can give children positive feedback in learning and daily activities, affirm their efforts and abilities, enhance their confidence in completing tasks, and reduce their tendency to cheat to obtain success. For example, when a child encounters difficulties in learning, teachers should encourage them, tell them that they have the ability to solve the problem, and guide them to complete the task through their own efforts, rather than relying on cheating.

Zheng et al. (2024) found that a brief integrity intervention can help initially honest children maintain their honesty, although it cannot dissuade initially cheating children from cheating. Therefore, schools should carry out integrity education activities regularly, such as integrity lectures, integrity theme classes, and integrity signature activities, to enhance children's awareness of integrity and guide them to establish the concept of honesty. In addition, schools should pay attention to the early prevention of cheating, identify and guide children with cheating tendencies in a timely manner, and avoid the formation of long-term cheating behavior.

Referencing the research of Zhao et al. (2024a), schools can create a trusting environment for children, let them feel trusted by teachers and peers, and enhance their sense of responsibility and moral awareness. For example, teachers can entrust children with certain tasks (such as managing class supplies, helping younger students), let them realize that they are trusted, and thus encourage them to behave honestly.

Table 2. Summary of key literatures on approaches to promote early honesty.

Literature	Research Object	Intervention Approach	Core Finding
Ma et al. (2025)	3–6-year-old Chinese children (N=247)	Moral pride induction	Moral pride induction significantly reduces children's lying behavior.
Sai et al. (2025)	Preschool Chinese children (N=208)	Positive moral story education (with/without external appeals)	Positive moral stories promote honesty; combining with external appeals has no additional effect.
Liang et al. (2025)	7–11-year-old children	Positive moral story education (positive consequences of honesty)	Positive moral stories promote honesty, especially for 7–10-year-old children.
Zhao et al. (2025)	3–6-year-old Chinese children (N=480)	Conveying adults' emotional reactions	Telling children about adults' emotional reactions to honesty/dishonesty reduces cheating.
Zhao et al. (2024a)	Kindergarten children (mean age 5.94 years, N=328)	Trust induction	Trusting children to help reduces their cheating behavior.
Zhao et al. (2024b)	5–6-year-old children	Positive self-efficacy feedback	Positive feedback on task-specific self-efficacy reduces cheating.
Zheng et al. (2024)	5-year-old children	Brief integrity intervention	Integrity intervention helps initially honest children maintain honesty.

Peer guidance approaches

Peer interaction is an important part of children's growth process, and peers can also play a guiding role in promoting children's honesty. Hecker et al. (2024) found that cognitive empathy can promote children's honesty when interacting with unfamiliar peers, indicating that peer interaction can be used to cultivate children's empathy ability and further promote their honest behavior. For example, schools can organize group activities, let children cooperate and communicate with each other, enhance their understanding of others' feelings and interests, and guide them to choose honest behavior in peer interaction.

In addition, Meng et al. (2026) found that social comparison information can affect children's default tendencies towards honesty. Therefore, teachers and parents can use positive peer examples to guide children, let them learn from honest peers, and enhance their own honest awareness. For example, when a child behaves honestly, teachers can praise them in front of the whole class, let other children take them as an example, and form a positive peer influence.

Multi-environmental synergy approach

Children's honesty development is affected by multiple environments, and a single education approach is difficult to achieve the best effect. Therefore, it is necessary to form a synergy between family, school, and society to jointly promote children's honesty development. For example, family and school should maintain consistent educational concepts, parents should cooperate with teachers to carry out honesty education, and timely communicate with teachers about children's performance at home and school; society should create a positive social atmosphere, advocate the virtue of honesty, and provide a good external environment for children's honesty development.

In addition, it is necessary to pay attention to the individual differences of children. Meng et al. (2026) found that there are individual differences in children's default tendencies towards honesty, and Yu et al. (2025) found that children's cheating tendency is stable over time. Therefore, when carrying out honesty education, it is necessary to formulate targeted education plans according to children's individual characteristics, such as providing more guidance and support for children with strong cheating tendencies, and maintaining the honest behavior of children with strong honest awareness.

Results and discussion

Based on the systematic collation and analysis of the related literatures, this review summarizes the factors influencing children's cheating behavior and the approaches to promote early honesty. In terms of influencing factors, children's cheating behavior is jointly affected by individual internal factors and external environmental factors. Individual internal factors include cognitive development (theory of mind, inhibitory control, default tendency), moral emotion (moral pride, perception of others' emotions), self-efficacy, and empathy ability; external environmental factors include adult trust, school education and intervention, social cognition, and adult evaluation.

In terms of promotion approaches, effective approaches to promote early honesty include family education approaches (inducing moral pride, conveying emotional expectations, establishing trust), school intervention approaches (moral story education, self-efficacy feedback, integrity intervention, creating a trusting environment), peer guidance approaches (enhancing empathy, using positive peer examples), and multi-environmental synergy approaches. These approaches are targeted at different influencing factors and can effectively reduce children's cheating behavior and promote their honesty development.

Key findings and theoretical implications

The key findings of this review have important theoretical implications for the field of children's moral development. First, the "permission paradox" found by Chadmen et al. (2026) challenges the traditional assumption that cognitive and moral aspects of deception can be isolated, indicating that moral considerations are deeply involved in children's cognitive processing of deception, which enriches the theoretical research on the relationship between cognitive development and moral behavior. Second, the research on moral pride (Ma et al., 2025) and adult emotional reactions (Zhao et al., 2025) shows that moral emotion is an important driving force for children's honest behavior, which supplements the theoretical system of moral emotion and moral behavior, and provides a new perspective for understanding the internal mechanism of children's honesty development. Third, the research on trust (Zhao et al., 2024a) and self-efficacy feedback (Zhao et al., 2024b) shows that social factors and individual psychological factors interact to affect children's honesty, which enriches the research on the external conditions of children's moral development and provides a theoretical basis for the design of intervention approaches. Fourth, the research on the consistency of cheating behavior (Zheng et al., 2024) and the stability of cheating tendency (Yu et al., 2025) indicates that early childhood is a critical period for the formation of children's moral behavior, and early intervention is crucial for promoting children's honesty development, which emphasizes the importance of early moral education.

Practical implications

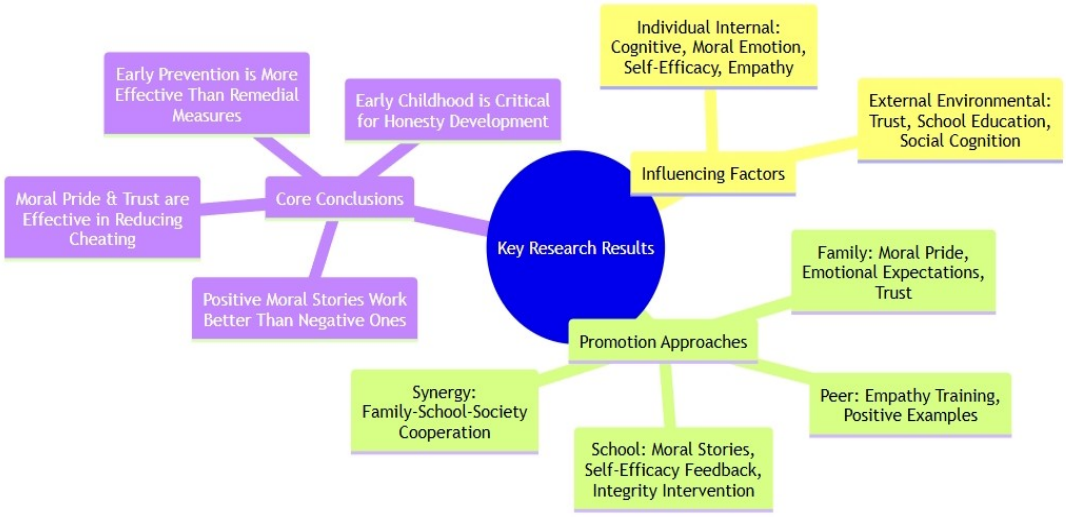


Figure 3. Summary of key research results.

The research results of this review also have important practical implications for parents, educators, and researchers. For parents, they should pay attention to cultivating children's moral pride, convey clear emotional expectations, establish a trusting relationship with children, and create a good family environment for children's honesty development. For example, parents should avoid excessive criticism and blame when children make mistakes, and guide them to admit their mistakes and correct them through positive guidance; they should also set an example of honesty, because children's moral behavior is largely influenced by their parents' behavior.

For educators, they should use positive moral stories in teaching, give children positive self-efficacy feedback, carry out integrity intervention activities, and create a trusting and positive school environment. In addition, educators should pay attention to the individual differences of children, formulate targeted education plans, and strengthen the cooperation with parents to form a

synergy of education. For example, teachers can communicate with parents regularly to understand children's performance at home, and work together to guide children's honest behavior.

For researchers, the research results of this review point out new research directions, such as the internal mechanism of the "permission paradox", the age difference in the effect of moral stories, and the long-term effect of various intervention approaches. Researchers can further carry out empirical studies to explore these issues, and provide more theoretical support and practical guidance for children's honesty education.

Conclusion

Although the existing literatures have made rich achievements in the field of children's cheating behavior and honesty development, there are still some research gaps. Most of the existing studies are cross-sectional studies, and the longitudinal research on the long-term development of children's cheating behavior and honesty is relatively insufficient. Although Yu et al. (2025) and Zheng et al. (2024) conducted longitudinal studies, the follow-up time is relatively short (1 year), and it is necessary to carry out longer-term longitudinal studies to explore the stability and development trend of children's honesty. The existing studies mainly focus on children aged 3–16 years, but there is a lack of research on younger children (under 3 years old), and it is not clear when children's cheating behavior begins to appear and how it develops in the early stage. The intervention approaches are mostly targeted at a single factor, and the comprehensive intervention approaches combining multiple factors are relatively few. It is necessary to explore more comprehensive and effective intervention programs to promote children's honesty development. Most of the existing studies are conducted in Chinese and Singaporean cultural backgrounds, and the research results may have cultural limitations. It is necessary to carry out cross-cultural studies to explore the differences in children's cheating behavior and honesty development in different cultural backgrounds, and provide more universal theoretical and practical guidance.

Based on the existing research gaps, this review puts forward the following future research directions. First, carry out longer-term longitudinal studies to track the development of children's cheating behavior and honesty from early childhood to adolescence, and explore the factors affecting the stability and change of children's moral behavior. Second, expand the research object to younger children (under 3 years old), and explore the initial development of children's cheating behavior and the early factors affecting their honesty development. Third, develop comprehensive intervention approaches combining multiple factors (such as combining moral story education with self-efficacy feedback, combining family education with school intervention), and test their effectiveness and long-term impact. Fourth, carry out cross-cultural studies to compare the differences in children's cheating behavior and honesty development in different cultural backgrounds, and explore the influence of cultural factors on children's moral development. Fifth, use more advanced research methods (such as brain imaging technology, eye-tracking technology) to explore the neural mechanism of children's cheating behavior and honesty development, and deepen the understanding of the internal mechanism of children's moral behavior.

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EARLY DIAGNOSTIC CRITERIA FOR NON-CHEMICAL ADDICTIVE BEHAVIOR IN ADOLESCENTS

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Abstract. *The rapid advancement of digital technologies exerts a profound influence on the socialization processes of adolescents, driving a rise in non-chemical dependencies, particularly internet gaming disorder and social media addiction. While the late stages of behavioral addiction manifest through overt disruptions in psychological and social adaptation, the initial period of its formation is frequently latent. This study aims to identify and scientifically substantiate the primary psychological diagnostic criteria and contributing factors that lead to the emergence of non-chemical addictive behavior in adolescents. Based on psychometric assessments and statistical analysis conducted among adolescents, it was established that high emotional instability, personal anxiety, specific character accentuation types, and inter-familial conflicts serve as early diagnostic markers. The criteria developed in this study facilitate the timely organization of targeted preventative measures within educational institutions before behavioral deviations escalate into clinical dependency.*

Keywords: *non-chemical addiction, behavioral dependency, adolescence, early diagnostic criteria, psychological predictors, internet gaming disorder, emotional instability, latent period.*

INTRODUCTION

The current stage of human development is characterized by the rapid penetration of digital technologies into all aspects of society and the unprecedented expansion of the information space. These global processes, while creating broad opportunities for increasing the intellectual potential of the younger generation, also create new types of socio-psychological risks that negatively affect their mental development and socialization processes. Among these problems, the growing number of immaterial, that is, forms of behavioral dependence in teenage children, in particular, cases of chronic attachment to virtual games, social networks and various technical means, has become one of the most pressing issues in modern psychological science.

The national mentality of the Uzbek people, their centuries-old family values and traditions of upbringing require that a child grows up not only physically, but also spiritually and morally. In the Eastern family model, mutual trust, respect, and emotional closeness in parent-child relationships serve as the main protective factor in a teenager's finding a place in society. However, the influence of modern information attacks and the attractiveness of the virtual world, leading teenagers to distance themselves from the family environment and prefer virtual communication to live relationships, is creating certain difficulties in the traditional education system. Adolescence is characterized by its biological, psychological, and social crises, emotional instability, and strong need for self-expression. If at this stage a teenager cannot find his place in real life, at school or in the family, then elements of addiction to the virtual world begin to form as a means of escaping internal experiences and mental stress. In the studies of domestic and foreign psychologists, behavioral deviations and addiction problems have been studied from various aspects. However, many scientific works are focused on analyzing the already formed, clearly visible clinical stages

of addiction, in which the consequences of mainly mental and social maladjustment are studied. However, the transition from normal use to pathological dependence, that is, the stages of latent and initial formation of dependence, have not been sufficiently studied. It is precisely during this transitional period that the lack of developed psychological criteria for identifying negative changes in behavior creates a gap in scientific research. The existence of this scientific problem determines the purpose of this study. The purpose of the study is to identify the initial diagnostic criteria associated with personal characteristics, emotional states and the family environment that set the stage for its manifestation, and to systematically substantiate them, before the immaterial addictive behavior in adolescents goes into a stagnant form. The identification of these criteria will serve as a practical basis for school psychologists and educators to properly organize targeted preventive work before the onset of deep psychological crises in the lives of adolescents.

LITERATURE REVIEW AND METHODOLOGY

The formation of personality in adolescence, the occurrence of dynamic changes in its behavior, and the issues of susceptibility to various deviations have been studied in depth and systematically in psychological science. According to the sources of the disciplines of general psychology and deviant behavioral psychology in the Uzbek higher education system, the types of non-material (chemical) dependence are interpreted at the initial stage as deviations (deviations) of social adaptation caused by a violation of the internal psychological needs and emotional state of the individual. Founder of the Uzbek School of psychology, professor E.In his fundamental works, ghoziyev rates adolescence as the most acute, confrontational, and crisis phase of personality maturation. E.As Goziev points out, at this age, there is a deep imbalance between a teenager's physical and sexual development and his social status. The teenager develops a "sense of adulthood", but he or she does not yet fully possess the skills to make independent decisions in social life. In this state of internal conflict, the teenager has difficulty managing his emotions. According to the concept of goziev, if a teenager's need for self-expression and recognition among his peers is not met in real life, he begins to look for alternative and easy ways to meet his needs, which is the first foundation of attachment to virtual space. Academician A.In general psychology theories under Petrovsky's revision, a three-stage model of personality formation (adaptation, individualization and integration) is advanced. According to Petrovsky's teaching, a teenager experiences a strong mental strain in the process of adapting (adaptation) to the microenvironment to which he belongs (family, class community) and showing his own difference in it (individualization). If the school or family environment fails to integrate the adolescent's personality, the individual experiences "disintegration," or alienation. During this period, due to the underdevelopment of the will and emotional sphere, the teenager uses the mechanism of avoiding subjective difficulties (escape), which is considered in science as the psychological basis of intangible addictive behavior. Deviant is known in local sources of the science of behavioral psychology, in particular, as professor V.Karimova's research has shown that the system of family relationships and social perceptions is the leading factor in the formation of social behavior. V.Karimova attributes any deviant behavior in adolescents to a crisis in communication in the group and family. Excessive pressure on the adolescent's personality by parents (hyperopeka) or, conversely, complete neglect (hypopeka) creates an "emotional void" in the adolescent.

A renowned researcher and psychologist, While classifying behavioral deviations, Ivanov defines Addictive Behavior (Addictions) as an individual's refusal to solve their own life problems and transition to an artificially created compensatory world. According to Ivanov's approach, non-chemical addictions (computer, gaming, information addiction) have the same psychological

nature as material addictions. At the heart of all of them is the person's emotional instability, lack of emotional support from loved ones, and high levels of subjective anxiety. According to the general conclusions of scientists who have studied behavioral deviations, the following internal psychological patterns are observed during the early formation of non-material dependence:

- Emotional lability: Sudden mood swings and low stress tolerance (frustration);
- Accentuated character traits: Exaggeration of certain personality traits and increased susceptibility to external influences;
- Social devaluation: Loss of value of real-life values and obligations (study, live communication).

B., who carried out research in Uzbekistan on the problems of personality diagnostics and the study of individual-psychological characteristics.Kadyrov developed a system for early identification of the inclinations and abilities of a person. Applying this system to the prevention of deviant behavior, we can say that early diagnosis of any deviation means identifying its personal predictors (latent tendencies) before the clinical symptoms of the problem appear. Analysis of academic sources shows that in the early stages of the formation of non-chemical addictive behavior in adolescents, there is no grossness or obvious nervousness in behavior. On the contrary, as noted in general psychology, as preliminary criteria, hidden dynamic signs come to the surface, such as an increase in the internal defense mechanisms of an individual, a decrease in self-assessment, a retreat to his own inner world or an attempt to close real-life failures through virtual achievements. Thus, E.Goziyev, A.Petrovsky, V.Karimova and V.The scientific views of scientists such as Ivanov scientifically substantiate the need to study the early diagnostic criteria for non-material dependence behavior not only through external symptoms, but also in the context of the emotional-volitional sphere of the adolescent personality and the crisis of his system of relations in the microenvironment.

The methodological basis of this study, aimed at identifying early diagnostic criteria for the formation of non-chemical addictive behavior in adolescents, was the principles of the unity of activity and communication in personality formation and a systematic approach. An empirical strategy combining quantitative and qualitative analysis was used with the aim of identifying latent (latent) changes in adolescent life chosen as the object of the study.

The process of collecting empirical data was organized among upperclassmen of secondary schools. A total of one hundred and twenty adolescents participated in the study. The age range of participants covered the period from thirteen to sixteen years of age, which is considered the most critical stage of adolescence. The sample was formed in a gender-balanced ratio in order to study the individual psychological characteristics of adolescent boys and girls in a balanced manner. The study was conducted outside of class hours, with voluntary participation of students and official consent of the educational institution's administration, in compliance with all ethical criteria.

To achieve the research objective and systematically extract early criteria, the empirical process was carried out in three consecutive stages:

1. **Preliminary qualifying (screening) stage:** in this stage, the degree of predisposition of adolescents to the virtual environment and the media was studied. The goal was to identify not adolescents with established clinical addiction, but a "risk group" in which the elements of addiction were still latent, but the deviation from the norm was beginning. Stage of diagnosing personal and emotional characteristics: The internal mental states of the adolescents identified in the first stage were studied. A set of psychological questionnaires

was used, the validity of which was established in academic higher education programs and adapted to the Uzbek language environment. At this stage, the level of personal anxiety, emotional instability, and nervousness in adolescents was measured.

2. **Microsocial environment analysis stage:** V.In accordance with Karimova's concept, since deviations in the personality of a teenager cannot be studied in isolation from his family environment, the nature of relationships within the family, the form of parental control, and the level of emotional intimacy were analyzed using a special psychological questionnaire. The following traditional set of tests and questionnaires was used to form early diagnostic criteria, which are widely used in general and deviant behavior psychology and are free from obscure or artificial concepts:
3. **Internet Addiction Level Assessment Test:** It was used to subjectively assess the time a teenager spends in the virtual world, the first decline in academic performance due to this activity, and the disruption of the time schedule. Questionnaire for determining character accentuations: Used to diagnose pronounced forms of character traits in the adolescent personality, especially hysteroid and schizoid traits. This is E.This allowed for a scientific assessment of the character changes observed by Goziev during adolescence.
4. **Personal and situational anxiety scale:** Used to determine the adolescent's general mental background and his emotional responsiveness to external stressors. Family Relationship and Parental Bonding Questionnaire: Designed to explore hidden conflicts within the family, emotional coldness, or tendencies to reject the adolescent's identity.

Mathematical and statistical analysis methods were used to ensure the reliability and scientific value of all collected empirical indicators. A correlation analysis was performed to determine the causal and reciprocal relationships between the individual characteristics of the individual (anxiety, emotional lability) and the indicators of dependence on the virtual environment. A variance analysis method was also used to compare the average scores of groups of adolescents with different character accents and to assess the strength of their influence on the formation of addictive behavior. All the results obtained were processed using special statistical programs and confirmed at a high level of scientific reliability.

The level of manifestation of non-chemical addiction elements in adolescents by types of character accentuations (Results of the analysis of variance)

Note: This table is from E.Gaziyev and V.According to Ivanov's theories, the average score shows which character types are most likely to become addicted to the virtual world (the highest risk score is 100 points).

Character accentuation types (E.By goziev)	Number of adolescents at risk	Average score of addiction symptoms (in points)
Hysteroid type (Tends to attract attention from others)	38 people	74.5 points
Schizoid type (Tends to be lonely and withdrawn)	32 people	71.2 points
Hyperthymic type (Overactive and outgoing)	28 people	42.1 points
Stable (Regulatory) type (Has mental balance)	22 people	28.4 points

Table analysis shows that adolescents with hysteroid (74.5 points) and schizoid (71.2 points) character traits have the highest level of non-material dependence elements. It was statistically confirmed that hyperthymic and stable personality types of adolescents had significantly lower rates of addiction to the virtual world.

DISCUSSION

The mathematical and statistical data obtained during the study show that non-chemical addictive behavior in adolescents is not just a random pastime, but the result of deep personal and microsocial crises. The results obtained contribute to enriching the laws of the Uzbek school of psychology and classical psychology in the context of the new digital environment.

The correlation analysis revealed a high positive correlation between emotional instability (0.52) and personal anxiety (0.48) and the elements of virtual addiction. This is the case with V. fully confirms Ivanov's approaches to the nature of addiction. That is, emotional lability and a heightened sense of anxiety in a teenage personality force them to seek an alternative, safe, and anxiety-free virtual world. The manifestation of frustration, that is, the indicator of resilience to life's difficulties and obstacles, at a negative value (-0.41), indicates the adolescent's weak will in solving real-life problems. Instead of solving the problem, the teenager tries to temporarily restore his mental balance by escaping into the virtual world (defense mechanism). Dispersion analysis results (Table 1) Prof. E.Gaoziev's views on character changes and accentuations during his adolescence were practically proven. The study found that adolescents with histrionic (74.5 points) and schizoid (71.2 points) character accentuation were at the highest risk. The reasons for the attachment of these two groups to the virtual environment have different psychological natures:

For teenage girls, virtual space (social networks, online games) is a platform for self-expression, being in the spotlight, and easily gaining recognition and praise (in the form of virtual achievements, subscribers) that they lack in real life.

For schizoid adolescents, on the contrary, the virtual world serves as a means of protection from failures in live communication, from the harassment of peers and from external intrusions into their inner world, and as a means of compensating for loneliness. It is these circumstances that allow us to formulate early diagnostic criteria for non-chemical addiction. In the early stages, the teenager does not yet show obvious aggression or severe consequences such as complete withdrawal from school. However, an increase in subjective anxiety in a person, a sharp change in mood against the background of petty misunderstandings in the family (emotional lability) and a tendency to prioritize virtual achievements rather than real obligations should be assessed as the first hidden diagnostic markers of the formation of dependence.

RESULTS

With schizoid and withdrawn adolescents: Through cognitive-behavioral therapy and art therapy methods, their internal anxiety was reduced, and the mechanism of escape into the virtual world was eliminated.

With hysterical and attention-seeking teenagers: Their desire to gain recognition through fake followers in the virtual world has been redirected to creative, social activities in real life (theater, volunteering, sports).

Socio-psychological trainings (Restoring the communication system):

Adolescents received special training to develop real-life communication skills with peers, increase willpower to cope with frustration (obstacles), and develop stress management strategies.

Measures to improve the family environment: V.In accordance with Karimova's concept, family counseling centers were established to fill the "emotional gap" between parents

and teenagers and to introduce digital hygiene rules (hours of communication without smartphones) in the family.

CONCLUSION

Studies on the development of early diagnostic criteria for the formation of non-chemical addictive behavior in adolescents allow us to draw the following important final conclusions:

Hidden nature: Non-material elements of addiction are not manifested in the initial stage by obvious aggression or sharp deviations in behavior. Since the period of its formation is hidden (latent), in the process of early diagnostics, attention should be paid not to the external actions of the teenager, but to his internal mental state.

Systemic criteria: The study identified three main diagnostic criteria that allow for early detection of addiction:

Psychological criteria: High anxiety in the individual, intolerance to life's obstacles, and the presence of histrionic and schizoid character accentuations.

Emotional criterion: Emotional instability and choosing the virtual world as the only comforting environment to avoid any mental stress or depression.

Social criterion: The replacement of live communication with virtual connections and the loss of spiritual and emotional closeness between parents and children in the family.

The application of these early diagnostic criteria to the educational system will allow school psychologists to organize targeted preventive and corrective work in a timely and effective manner, before addictive behavioral patterns develop into stable clinical dependence.

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PROBLEMS OF ADAPTING HIGHER EDUCATION PROGRAMS TO INTERNATIONAL STANDARDS AND EFFECTIVE WAYS TO OVERCOME THEM

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Abstract: *This article analyzes the need, theoretical and methodological foundations and practical significance of improving higher education programs based on international educational programs and standards. International experience, in particular, the example of vocational education systems of UNESCO, OECD and European countries, highlights effective mechanisms for training competitive specialists in line with the requirements of the labor market. Also, the prospects and current issues of integrating the higher education system of Uzbekistan with international standards are considered.*

Keywords: *higher education program, credit module, competency-based approach, accreditation, quality of education, international standards.*

Globalization, digital transformation, and rapid labor market renewal require that higher education programs not be limited to the formation of national standards. In today's conditions, the quality of an educational program is determined not by the list of subjects or the number of classroom hours, but by the graduate's acquisition of specific professional, research, communicative, digital, and ethical competencies, reliable assessment of these results, and regular updating in accordance with the needs of stakeholders. The Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030 identifies strengthening the integration of education, science, and production, developing international cooperation, and training competitive personnel as priority areas [Decree of the President of the Republic of Uzbekistan dated October 8, 2019 No. PF-5847 “On Approval of the Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030”. – Tashkent, 2019].

The strategy "Uzbekistan - 2030" sets the tasks of increasing the international competitiveness of higher education, conducting international accreditation of educational programs, and implementing advanced foreign experience in the process of personnel training. These tasks require interpreting the adaptation of educational programs to international standards as a systemic reform that covers educational goals, content, methods, assessment tools, faculty potential, and internal quality system [Decree of the President of the Republic of Uzbekistan dated September 11, 2023 No. PF-158 "On the Strategy of Uzbekistan - 2030". - Tashkent, 2023].

From a pedagogical point of view, the concept of "adaptation to international standards" does not mean complete copying of the curriculum of a foreign university. It is the process of integrating internationally recognized quality criteria into the internal logic of the educational program, while maintaining the national educational goals, language, culture, economy and professional characteristics. V.A. Slastenin emphasizes the need to view the content of education in the unity of the social order of society, the requirements of personal development and

professional activity, therefore international standardization should be harmonized with global quality criteria without denying the national context [Slastenin V.A. Pedagogy. – Moscow, 2002].

The concept of outcome-based education serves as a methodological basis for adapting the educational program to international standards. In an outcome-based approach, the program is first determined by what the graduate should know, what practical tasks he should be able to perform, and what professional values he should have, and only then are subjects, modules, pedagogical technologies, and assessment tools selected [Spady W.G. Outcome-Based Education: Critical Issues and Answers. – Arlington, 1994]. The principle of constructive coherence, developed by J. Biggs and C. Tang, requires a direct connection between the expected learning outcomes, teaching activities, and assessment tasks [Biggs J., Tang C. Teaching for Quality Learning at University. – Maidenhead, 2011].

International higher education standards do not consist of a single document or a rigid curriculum. They constitute a multi-level normative and methodological system that complements each other. The first level is a framework of qualifications and degrees, which determines the level of complexity, independence and responsibility of the bachelor's, master's and doctoral levels. The second level is a mechanism for credit accumulation and recognition, in which ECTS credits are tied to the real educational workload and achieved results of the student. The third level is standards for internal and external quality assurance of education. The fourth level is subject standards and accreditation criteria specific to engineering, computer science, natural sciences or other fields.

In the European Higher Education Area, the ESG standards define the development and validation of educational programs, student-centered teaching, assessment, admission and graduation, the quality of teaching staff, educational resources, information management, open information to the public, regular monitoring of programs and periodic external evaluation as integral parts of the internal quality system [ENQA. Standards and Guidelines for Quality Assurance in the European Higher Education Area. – Brussels, 2015]. Thus, international compatibility is measured not only by updating the curriculum, but also by how decisions about the program are made, how evidence is collected and what adjustments are made based on the results.

In the ECTS system, a credit represents the total work input of a student, including lectures, practical work, laboratory work, independent work, project work, preparation work and supervision. Therefore, the credit volume of a module should be based on an analysis of the real workload, and the module description should indicate the expected outcomes, content, teaching methods, assessment methods and prior knowledge [European Commission. ECTS Users' Guide. – Luxembourg, 2015]. The mechanical distribution of credits leads to an excessive increase in student workload, uncontrolled independent learning and problems with the recognition of subjects in academic mobility.

In engineering education, the ABET criteria require evidence-based support for program learning objectives, student outcomes, continuous improvement, curriculum, faculty, infrastructure and institutional support.

ABET's 2025–2026 criteria specifically identify outcomes such as solving complex engineering problems, designing, effective communication, professional ethics, teamwork, experimentation, and independent mastery of new knowledge [ABET. Criteria for Accrediting Engineering Programs, 2025–2026. – Baltimore, 2025]. These criteria can serve as an important basis for transforming the educational program from a set of disciplines to a system of professional

activity results for Tashkent State Technical University, which was chosen as an experimental testing ground.

ASIIN accreditation assesses engineering, computer science, natural sciences and mathematics programs in terms of learning outcomes, degree profile, logical structure of the curriculum, resources, quality management and relevance to professional practice. ASIIN recognition confirms that the goals set by the program meet the requirements of scientific and professional practice and that there are stable conditions for good teaching and successful learning [ASIIN. Criteria for the Accreditation of Degree Programmes. – Düsseldorf, 2025]. The application of this approach to the fundamental science programs of the National University of Uzbekistan, another experimental test bed, shows that international accreditation also covers the program logic and results assessment system in the field of natural education.

CDIO standards are of particular importance in adapting engineering programs to practical activities. CDIO 3.0 covers twelve areas, including context, program outcomes, integrated curriculum, introduction to engineering, design and creation experience, modern workplaces, active learning, faculty competence, assessment and program monitoring [Worldwide CDIO Initiative. CDIO Standards 3.0. – 2020]. The CDIO approach allows technical universities to combine theory, laboratory, project and production practice into a single professional cycle.

In the areas of information technology, the ACM and IEEE recommendations prioritize competencies, professional practice, and adaptability over a list of disciplines, given the rapid obsolescence of program content. The Computing Curricula 2020 report emphasizes the need to form the knowledge, skills, and professional behavior of a computing education graduate in an integrated manner [ACM, IEEE Computer Society. Computing Curricula 2020: Paradigms for Global Computing Education. – New York, 2020]. The Information Technology Curricula 2017 recommends aligning the information technology program with user needs, infrastructure, networking, cybersecurity, integrated systems, and professional practice [ACM, IEEE Computer Society. Information Technology Curricula 2017. – New York, 2017].

Within the framework of the study, based on the analysis of the experiences of higher education institutions in organizing higher education based on international standards, the following was identified:

The first problem is the misinterpretation of the content of international standards. In practice, international compliance is sometimes limited to translating subject names into English, increasing the share of foreign literature, or adding several new subjects to the curriculum. This approach does not change the graduate results, assessment, and continuous improvement system, which are the main elements of the quality of the program. International standards, in addition to the question “which subject is taught?”, require answers to the questions “what can a graduate do?”, “by what evidence is this result proven?” and “how will the program change if deficiencies are identified?”

The second problem is the expression of learning outcomes in a general and immeasurable form. Phrases such as “will acquire modern knowledge”, “will use advanced technologies” or “will become a competitive specialist” indicate the purpose of the program, but do not provide clear criteria for assessment. The results should be expressed in terms of the context of implementation and the expected level of independence. For example, at TDTU, “will design the efficiency of the energy system based on technical, economic and environmental constraints”, at the National University of Uzbekistan “will analyze experimental or theoretical data based on a scientific

model", at TUTU, "will identify risks in the information system and develop a risk-based protection architecture" can be assessed.

The third problem is the insufficient systematization of the relationship between program outcomes and modules. In many programs, each subject performs its own function, but it is not clear how all subjects together form the graduate's competence. In the absence of a "curriculum map", some outcomes are repeated in several subjects, and some important competencies are not fully formed by any subject. Mapping the outcomes according to the stages of "introduction - development - consolidation - demonstration" ensures the consistency of the curriculum.

The fourth problem is that in the credit-module system, credits are not sufficiently justified by the real workload. The volume of assignments, independent learning and assessment of modules with the same credit can differ significantly. Regular measurement of student workload during the semester, coordination of the assignment calendar and revision of module credit ensure the real functioning of ECTS. Otherwise, the credit system becomes only a unit of account, limiting the possibility of academic mobility and recognition of subjects.

The fifth problem is the inconsistency of assessment tools with educational outcomes. Competencies such as complex engineering design, scientific analysis, software development, or professional communication cannot be assessed solely by written tests. For this, it is necessary to use projects, laboratory protocols, case studies, portfolios, presentations, practical exams, and standardized forms. R.M. Harden emphasizes that assessment in outcome-based education should reflect the content of the expected professional activity [Harden R.M. Outcome-Based Education: The Future is Today. – Medical Teacher, 2007. – Vol. 29(7). – P. 625–629].

The sixth problem is the formal nature of stakeholder participation. The employer's signature on the curriculum does not necessarily mean that the employer is actively involved in the development of the program. In international practice, advisory boards regularly discuss program goals, graduate profiles, new technologies, internships, and capstone projects. The opinions of students, alumni, and young professionals are also important evidence in identifying program overload, duplication, and missing skills and support services.

The seventh problem is that the training of professors in international program design and assessment methodologies is different. International accreditation is often assigned to a separate working group, while the rest of the teachers perceive the process as a document preparation task. In fact, each teacher should understand their module results, assessment evidence, and their contribution to the program results. Therefore, the faculty development program should cover international criteria, outcome writing, rubrics, assessment literacy, academic English, digital pedagogy, and applied research.

The eighth problem is the fragmentation of quality assurance mechanisms. If HEMIS, LMS, dean's office, department, graduate monitoring, employer survey, and control results are stored in separate databases, the program creator cannot see the overall quality picture. For program management in accordance with international standards, a data panel, an annual program report, and a "problem - evidence - decision - change - reassessment" chain are necessary. If the assessment result does not lead to a decision, the information gathering becomes a formal process.

The ninth problem is the perception of international accreditation as a one-time external audit. Before accreditation, documents are quickly filled out, and after the audit, the system may become less active. The basic logic of ESG, ABET and ASIIN is the opposite, that is, quality is ensured by a stable internal system, and external accreditation checks its reliability. Therefore, it is

not important to pass accreditation, but the improvement of results from year to year should be the main indicator.

The tenth problem is to maintain a balance between international standards and national needs. The complete transfer of a foreign model can neglect local industry, infrastructure, language, legislation and social tasks. J. Knight defines internationalization as the process of integrating the international and intercultural dimensions of education into the goals, functions and practices of the university [Knight J. Internationalization Remodeled: Definition, Approaches, and Rationales. – Journal of Studies in International Education, 2004. – Vol. 8(1). – P. 5–31]. Therefore, international standards should not replace the content of national education, but should increase its quality and openness.

For the adaptation of educational programs to international standards to be effective, the process should be organized in a cyclical and evidence-based manner.

In the first stage, the current program, disciplines, assessment, resources, student workload, and graduate outcomes are diagnosed.

In the second stage, an analysis is conducted with the selected international standard, identifying missing outcomes, evidence, and management mechanisms.

In the third stage, the program objectives, graduate profile, learning outcomes, curriculum map, modules, and assessment tools are redesigned.

In the fourth stage, the program is validated with the participation of employers, students, graduates, external experts, and professional associations.

In the fifth stage, new or revised modules are tested in pilot groups, gathering evidence on student workload, achievement of outcomes, accuracy of assessment tools, and adequacy of resources.

The sixth stage involves external peer review or accreditation audit.

In the seventh stage, continuous improvement is implemented based on expert opinions, student outcomes, and stakeholder feedback.

This process begins again based on the logic of PDCA - plan, do, check, and improve.

In conclusion, when assessing the effectiveness of adapting educational programs to international standards, one should not be limited to the role of accreditation certificates or ratings alone. The main indicators should include the level of achievement of program outcomes, graduate employment, employer satisfaction, recognition of credits in academic mobility, balance of student workload, quality of capstone and research products, methodological development of professors and teachers, and implementation of annual improvement decisions. In this case, international standardization will serve to improve the real quality of education, not the external image of the university.

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SIMULATION TECHNOLOGIES AS A MEANS OF DEVELOPING THE PROFESSIONAL AND PRACTICAL PREPAREDNESS OF FUTURE SPECIAL EDUCATION TEACHERS

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Abstract. *This article examines the role of simulation technologies in developing the professional and practical preparedness of future special education teachers. It focuses on their use in professional activity design, pedagogical decision-making, and individualized approaches to learners. The article also highlights how simulated professional situations can connect theoretical knowledge with practical skills and improve teachers' readiness for real educational practice.*

Keywords: *simulation technologies, professional and practical preparedness, special education, professional competence, pedagogical decision-making, individualized approach.*

Introduction. Preparing future special education teachers requires more than theoretical knowledge. In professional practice, teachers need to assess learners' abilities and educational needs, select appropriate methods, organize learning activities, and adapt their actions to changing pedagogical situations. These tasks require not only knowledge but also the ability to apply it effectively in practice.

For this reason, contemporary teacher education needs approaches that provide students with opportunities to model professional situations and develop practical decision-making skills before entering real educational environments. Simulation-based learning creates such opportunities by allowing future teachers to practise professional actions, analyse different solutions, and reflect on the results of their decisions. Research in higher education shows that simulation-based learning can effectively support the development of complex skills, particularly when learners receive appropriate guidance and opportunities for reflection [1, pp.499–541].

The Role of Simulation Technologies in Professional Preparation. Simulation allows students to practise different elements of professional teaching activity in a controlled educational environment. Instead of simply following predetermined instructions, students are encouraged to analyse a situation, identify the main pedagogical problem, consider possible approaches, and justify their decisions. This approach is especially relevant to special education because teachers often work with learners who have different developmental characteristics, communication abilities, learning difficulties, and educational needs. Simulated situations can reflect a variety of professional cases and provide students with opportunities to practise appropriate responses. Research on classroom simulations in teacher education indicates that simulation can support the development of teaching-related knowledge and skills, classroom management abilities, and preservice teachers' confidence. At the same time, the effectiveness of simulation depends partly on the realism and authenticity of the learning situation [2, pp.14–26].

Professional Activity Design and Individualized Approaches. Individual differences among learners are an important consideration in special education. Learners may differ in their cognitive development, communication abilities, behaviour, level of independence, and participation in educational activities. Therefore, future teachers need to learn how to plan their professional activities according to specific learner characteristics rather than applying the same method in every situation. Simulation-based tasks provide an opportunity to model different learner profiles. Students can analyse the characteristics of a particular learner, determine appropriate educational objectives, select suitable methods and resources, and design an instructional response. They can also modify their strategies when the learner's needs or behaviour change. This process helps future special education teachers understand the connection between assessment, planning, teaching methods, and expected outcomes. A systematic review of mixed-reality simulation in special education teacher preparation shows that such technologies can be used to provide practice-oriented experiences for preservice special education teachers and to develop skills relevant to professional practice[3,pp.124–141].

Pedagogical Decision-Making and Professional Adaptability. In real educational practice, teachers frequently encounter situations that require immediate and appropriate professional decisions. Changes in learner behaviour, task performance, communication, or emotional state may require the teacher to reconsider a previously selected approach. Simulation makes it possible to model such situations in advance and allows students to compare different solutions before entering real professional practice. During a simulation, students can evaluate possible consequences, select an appropriate response, and reconsider their decision when the situation changes. Such practice contributes to the development of independent professional thinking and adaptability. Recent research on virtual simulated teaching also indicates that simulation combined with structured feedback can support preservice teachers' pedagogical decision-making and encourage more student-centred instructional strategies [4, pp. 123–139].

Simulation as a Means of Assessing Professional Preparedness.Simulation technologies can serve not only as instructional tools but also as a means of assessing students' professional and practical preparedness. During simulated tasks, it is possible to observe how students analyse professional situations, identify pedagogical objectives, select appropriate methods, justify their decisions, communicate with learners, and evaluate the results of their actions. Such assessment provides a more practical picture of students' preparedness than theoretical testing alone. It allows educators to identify which professional skills have been developed sufficiently and which areas require further practice. Students can also receive feedback on their decisions and use it to improve their subsequent performance. In this sense, simulation can combine learning and assessment within one educational process. Students first perform a professional task, then analyse their actions and receive feedback. This creates an opportunity for repeated practice and gradual improvement of professional skills.

Conclusion. Simulation technologies create opportunities for future special education teachers to connect theoretical knowledge with practical professional activity. Through simulated situations, students can practise analysing learner needs, designing educational activities, making independent pedagogical decisions, and adapting their approaches to changing circumstances. For special education teacher preparation, this is particularly important because professional activity requires an individualized approach, careful observation, flexible planning, and appropriate decision-making. The systematic use of simulation technologies can therefore contribute to the development of professional and practical preparedness and help future teachers enter real

educational settings with greater confidence and a clearer understanding of their professional responsibilities.

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MODERN METHODS OF INFORMATION PRESENTATION IN TELEVISION NEWS BROADCASTING

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Abstract. *This article examines contemporary methods of presenting news media products on television. A comparative analysis of news programs on Uzbek and Russian television reveals new approaches to traditional methods of delivering information to audiences, news promotion technologies on modern television, and methods for increasing viewer interest in channel-produced news programs through interaction with new media. The article also demonstrates the transformation of headlines, advertisements, and advertising tactics in television news products in the context of digitalization.*

Keywords: *television news broadcasting; information presentation; infotainment; hard news; soft news; news promotion; digitalization.*

Introduction. It is generally acknowledged that among the vast stream of information about life on our planet, news undoubtedly ranks first in importance. It is news that, above all, paints a constantly changing socio-political, economic, social, and cultural picture of the world, representing the most vital information for the functioning of society. Television undoubtedly dominates the rapid delivery of information to people around the world, ignoring borders and distances, bringing news to every home. Within the mass media system, television has established itself as the most convenient, accessible, regular, and vibrant news broadcasting channel. News is broadcast on TV by major stations for most of the day, creating not only a panorama of current events but also forming the basis of the daily program, figuratively speaking, its "skeleton." The significance of news for the audience, its volume, and the various forms of delivery determine the overall organization of a TV channel's information broadcasting.

On television, news is typically organized into news programs, which in television journalism theory are often referred to as "newscasts," "news bulletins," or "informational releases." They are not something static in form; the volume of their broadcasts and, naturally, the approaches to covering events, the level of objectivity, the nature of presentation, and the degree of dependence of television organizations on the political system of society change. Moreover, as the most mobile and significant, news broadcasts not only reflect the station's information policy but also influence other programs.

It has long been established that study of the experience of domestic and foreign television stations and channels in producing news programs, in our opinion, will not only allow us to identify patterns in the field of news broadcasting, but also answer questions concerning vital areas of modern domestic television journalism and develop effective means of improving the activities of television stations and television channels as a whole.

Review of the literature on the topic. In the process of researching the issue of forms and methods of presenting news information on television, it was found that very few works devoted

to this problem are available. Scientific thought is mainly focused on modern trends in the development of television broadcasting, its structural features, television genres, etc. It is enough to recall the works of A.S. Vartanov [3], V.V. Zvereva [7], K.P. Kovalev-Sluchevsky [10], G.V. Kuznetsov [11], P.I. Misyulya [13], S.A. Muratov [14] and others, devoted to the theory and practice of television in general.

The works of E. Fichtelius [20], V.L. Tsvik [21] were devoted to certain aspects of information television broadcasting.

Uzbek researchers A. Karimov [9], I. Rakhmatullaeva [18], P. Allambergenova [1], and others have made significant contributions to identifying the specific features of national television broadcasting.

Analysis of Russian television channels' experience in delivering news to viewers has been undertaken over the years by scholars E. Nikolskaya and M. Makeenko [15], L. Kostina [12], D. Bykov [2], E. Sheykhova, P. Ibragimova [23], and others. In their research, they attempted to define the types of information presentation in news programs from the perspective of a specific empirical approach: from the perspective of infotainment, from the standpoint of the characteristics of individual expressive screen media, and based on the technical capabilities of television studios.

Nevertheless, in the context of rapidly developing scientific and technological progress and an expanding range of technologies, the study of new formats for information presentation in modern television news programs within a comprehensive and systemic paradigm seems particularly relevant.

Research methodology. To identify general principles of news construction and the most effective ways to compose news reports, a method for analyzing information delivery methods at the textual level was used. As part of the conceptual content analysis, a text sentiment analysis was also applied, determining whether the news was positive, negative, or neutral.

The synthesis method allowed us to identify the visual characteristics of news stories included in the structure of news programs and to identify the most characteristic video and audio components of news information, such as introductions, stand-up comedy, voiceover, and others.

The comparative method was particularly important, reflecting not only the comparative analysis of foreign and Uzbek television channels but also the comparison of the on-screen language of the broadcasting structures under study and the methods used by different journalists to influence audiences.

Main Part.

The very nature of television and its impact on audiences are the subject of close attention from sociologists, politicians, philologists, psychologists, and others. This is not simply a tribute to television's popularity, but, above all, a manifestation of concern for the future of society, given the enormous role television plays in modern culture and social life. The speed of information transmission, the broad range of topics, the virtually unlimited geographical reach of on-the-spot broadcasts, the virtual presence effect, and the convenience of home viewing—the entire set of characteristic and distinctive features of television, as is well known, have ensured it has the largest audience in the early 21st century.

The role of news broadcasts in the structure of television production is steadily increasing. And as the renowned television journalism researcher A.S. Vartanov rightly noted, "a block of proprietary news programs is the most essential element that allows one to 'distinguish a reputable company from one that airs old films, liberally interspersed with commercials'" [3; 46].

There is widespread agreement that in the modern world, constantly receiving information from various spheres of life—economic, political, social, and cultural—has become the norm. Hence, news programs are the anchor points of any television company's broadcast schedule, with all other programs located in the intervals between news bulletins [6; 39].

"The calling card of any channel is information. It is the first injection the channel gives to a person waking up. It is what the channel sends off to sleep with; it is the energy that charges viewers with initiative or dampens it. And finding your own twists in the presentation of information is fundamentally important." This is the opinion of one of the most renowned organizers of Russian television broadcasting, O. M. Poptsov [16; 104].

News delivery today is influenced by:

- competition between television companies themselves;
- the presence of news from other media outlets;
- the programming focus of television stations, "format" requirements;
- the forced or deliberate combination of local and international news, important and entertaining, etc. [20; 23].

Modern television news journalism has a variety of forms and methods. Historically established methods of presenting operational materials, such as "infotainment," "event action," "build-up," "finishing," "headline," "hard news," "soft news," and others, are now being transformed into something entirely new.

Television news journalism today is challenging because it lacks rigid standards for news delivery, and the stories of many news programs are quite open-ended and sometimes extend beyond the scope of conventional reporting. But this places even greater responsibility on journalists, as new news reporting techniques require careful and competent use.

In news broadcasting, a distinction is made between "hard" and "soft" reporting.

"Hard" reporting. This involves clear answers to the classic questions "Who? What? Where? When? Why? How?" and a text structured like an "inverted pyramid." The journalist places the most important information in the headline, with the remaining details included throughout the text. With this format, the headline is uncluttered with secondary details and unnecessary details, so as not to distract from the main content. For example, the headline of one of the stories on the news program "Vakt" reads: "Uzbek chess player Zhavokhir Sindarov defeated his Indian opponent Rameshbabu Pragnanandhaa in the third round of the Candidates Tournament in Peira, Cyprus" [Poytaxt issue dated April 14, 2026]. The headline appears to be accurate and precise. But in reality, this headline contains virtually all the information about the event, and it is unclear why the viewer would continue watching the news program if they have already learned the most important information. Experts believe that a headline should, first and foremost, "lure" the viewer in, enticing them to watch not only the current news item, but ideally, the entire broadcast [5; 175-176]. In our opinion, a headline should contain some intrigue. For example, the headline of one of the stories featured in the April issue of "Vesti" reads as follows: "'Apartment Buildings Collapsed': Consequences of Israeli Strikes in Lebanon" [Vesti issue on the Rossiya 1 channel, April 29, 2026]. Naturally, such a headline will intrigue the viewer and encourage them to stay in front of the television. It should be especially emphasized that news headlines should not distort reality and should be accurate.

In television broadcasting, there are situations when something extraordinary happens and a news program on a particular channel reports it for the first time. A headline like "flash" should literally explode on the air. Even if it captures the essence of the event, the audience's attention, as

we see it, will still be riveted to the broadcast of a given television studio or channel. Here's an example: "A fire broke out at the Beshkurgan market near the Hippodrome" [Poytaxt broadcast on the Toshkent channel, April 5, 2026]. As we can see, the essence of the incident has been conveyed to the listener. But the questions—what kind of fire, what caused it, and what the consequences—remain—remain, meaning attention is riveted to the message, and the viewer will in any case await details.

"Soft" information. Foreign researchers call this method of information "human touch" [19; 103]. Domestic television broadcasters call it "bows."

It is important to note that the "hard" news format, which primarily features highly timely announcements, "soft" news is less timely, or rather, timeliness is less important.Touches and details highlight the unusual and entertaining, introducing a touch of intrigue. The soft news format allows for a closer look at the facts, shifting attention from the summary to the circumstances, and highlighting interesting details. Therefore, the news structure changes; the "inverted pyramid" principle of composition is unsuitable. The headline and introduction are constructed with viewer interest in mind; the essence is not immediately presented, but the most interesting part is delayed until the second or even third paragraph. Interest builds until the climax.

Journalists working in the soft news style on television are especially attentive to "visual reinforcements" – and these often prove truly valuable creative insights. For example, in one of the episodes of the Vesti program from March 6, 2025, in a selection of stories for International Women's Day, the correspondent, talking about men's preparations for this holiday, found unusual congratulations from Russians: the word "mama" laid out at the entrance to an apartment building using cars, a flower bed in the capital's park with an original frame "We cannot live in this world without women" [Episode "Vesti" of the channel "Russia 1" from 06.03.2025.], etc. And in the episode of the program "Poytaxt", also timed to coincide with a beautiful spring date, correspondent Sanobar Umarova managed to film an interesting story about the passion of our compatriots for flowers, simultaneously revealing the secret of the so-called "flower" flights [Episode "Poytaxt" of the channel "Toshkent" from 07.03.2024.].

When working on a television report, a journalist chooses the format of presentation that best suits the facts. Soft news is used when it's necessary to engage the listener, shifting the emphasis from the results to the circumstances. The circumstances of an event, or certain details surrounding the event, can be more interesting than the outcome. Many soft news are funny, entertaining, and add a touch of excitement to the news. For example: "There are still girls in Russia who...can stop a galloping horse and enter a burning hut." A case in Argentina is an example of this. A Russian woman not only managed to get her phone back from robbers but also helped catch an entire gang of thieves in the area. In the video, we see how a girl on a bicycle managed not only to grab hold of a robber, but also to knock him off his motorcycle and hold him until backup arrived [News episode of the Moscow 24 channel, November 17, 2025].

It is universally recognised that over the past decade, television broadcasting has seen a shift toward a so-called "human" approach to news, where events are depicted and illustrated, rather than simply dryly reported. Many researchers believe that audiences, especially young people, don't want to simply "listen" to the news, as they can get information from other sources, such as radio and the internet. People want to hear a "story about current events." Many Russians, in a survey conducted by Mediascope, responded that a "personalized presentation of news messages" is very important to them, and that they are "tired of 'wooden' boys on the air" [24].

In this regard, it is important to consider that small digression is necessary. The personalized way news is presented, in the minds of many of us, contradicts the fundamental principles that have been ingrained in Russian journalism for many years: news is just news, and nothing personal, no judgments, is allowed. But "humanizing" information doesn't mean evaluating it. It means personifying it—intoning it, emphasizing it, presenting it in a "human" way. As an example, consider a segment from the "Vesti" program about the so-called "advertising heralds," or simply "barkers," of Moscow. The segment, running 3 minutes and 12 seconds, tells the story of employees of outerwear, bakery, confectionery, and cosmetics stores whose loudspeakers disturb nearby residents. In particular, interviews were provided with a woman whose mother-in-law is paralyzed and with the mother of a four-year-old girl, who complained that loud noises had caused them to forget about rest, and that neither the patient nor the small child could fall asleep during the day [Vesti broadcast on the Rossiya 1 channel, February 9, 2025].

This example clearly demonstrates the type of "humanized news," i.e., news that presents an event or phenomenon through the prism of human stories.

It is regrettable that in the context of domestic television broadcasting, it is too early to talk about this; most journalists on Uzbek television news programs have a surprising and all-consuming passion for so-called "officialdom," the presentation of information within strictly defined frameworks.

The overabundance of official announcements on air only serves to alienate modern audiences. However, the older portion of listeners, accustomed to this particular manner of news delivery throughout their lives, still perceive official reports quite calmly, paying little attention to them. Nevertheless, the pace of life itself dictates different forms and methods of presenting news.

Journalistic material of any length requires truly creative work, a search for form, and a refinement of content. Russian researcher L. A. Vasilyeva urges: "Try to find new forms of news presentation, play with information, package it beautifully, make it sparkle with all the facets of an event..." [4; 56].

As this study has shown, methods of presenting information—"infotainment," "finishing," "event action," headline, and promotions—contribute new color to news programs and the stories they contain.

Infotainment "emerged as an acronym combining two words: information and entertainment, and expresses producers' desire to present news in the form of entertaining programs or with a touch of entertainment" [8]. The concept of "infotainment" implies adding vibrancy to a program presenting the events of the day or week, focusing on entertainment. Today, it's especially important for broadcasters to keep audiences glued to their televisions, and in this context, "interestingness" is becoming the primary criterion for news. Infotainment presupposes a dramatic narrative with a premise, development, climax, resolution, and recognizable characters. It is characterized by an emphasis on spectacle, brevity, and dynamism, clip-like editing, a high tempo, and rapid image changes.

In television news journalism, "infotainment" refers to a persistent and highly perceptible trend toward a gradual shift in the function of news: from informing to entertaining the audience. Numerous studies using television news show a significant shift toward celebrity news, entertainment, scandals, and crimes involving famous people, as well as lifestyle news [25]. Such "news-as-entertainment" helps to alleviate the tension of some newscasts, sweetening the news pill of the broadcast day. Here are some examples of news stories created in the infotainment format:

– "*A macaque baby named Punch, a resident of the Japanese zoo in Ichikawa, has not only become famous thanks to a viral video featuring a stuffed orangutan, but has also helped the zoo significantly increase visitor numbers from 20,000 to 90,000. Born in July 2025, the baby was abandoned by its mother, and zoo staff were forced to raise it themselves. During this period, the baby became attached to the stuffed orangutan, which effectively became its mother*.

Today, Punch is receiving messages and gifts from all over the world. The story of the Japanese macaque baby has become an example of how touching moments in the lives of animals can unite people around the world – and literally change the fate of an entire zoo" [Sevimli channel's "Zamon" episode, April 10, 2026].

"*A first-grader's mother has declared war on school extortion.*" This was the headline of a news report on the Vesti program. The report, broadcast by a Vesti correspondent in the Sverdlovsk region, featured Maria Korchina, a 34-year-old resident of Alapaevsk who refused to donate to the school fund. In an interview with the correspondent, the woman revealed that she had been asked to pay 6,500 rubles for school repairs. But the most intriguing part came at the end of the report, when the woman learned that her son hadn't even been enrolled in school yet [Vesti broadcast on the Rossiya 1 channel, September 4, 2024].

Modern news programs also often use infotainment as a re-enactment of the news. L.A. Vasilyeva believes that this method of presenting information allows for a variety of perspectives and, in its broad creative potential, is similar to a play-acting performance [4;81]. In particular, the March 3, 2025, news broadcast of the Vesti. Duty Station channel featured a report on a traffic accident caused by singer Alexander Buinov. The news of the singer hitting a kindergarten teacher at a crosswalk had already been part of the program on February 28 of last year. In the March broadcast, the correspondent presented the incident from the perspective of a reconstruction of the event, and through certain details (specially selected camera angles, special effects), the story was given a certain spectacle and staged feel [Vesti. [The "Duty Section" segment of the Rossiya 1 channel, March 3, 2025.]

It should be especially noted that television news programs have recently increasingly featured instances of so-called politicized infotainment, where the subjects are no longer show business personalities, but well-known politicians and prominent figures. As an example, we cite a segment from the Russian program "Vesti," which aired in April of this year.

"Correspondent: During a speech at the White House, King Charles III of Great Britain joked about the burning of the building by the British in 1814, calling it "a small attempt at development" and comparing it to the current renovation of the East Wing, initiated by US President Donald Trump.

This refers to the demolition of the East Wing of the White House to build a ballroom. According to the British king, US President Donald Trump decided on the changes after his visit to Windsor Castle last year. As the Daily Mail reported the day before, Trump broke protocol during his visit by patting Charles III on the shoulder. Body language expert Judy James noted that the gesture could have been politically motivated. In her opinion, (quote), "the touch was Trump's first genuine gesture of active, 'special' friendship." [Vesti broadcast on Rossiya 1, April 29, 2026.]

Another news delivery method worth focusing on is finishing. It's a journalistic technique that capitalizes on the resonance of a media report, revisiting one or more aspects of a situation, but from a new, unexpected perspective. On television, a modification of this method is manifested in the so-called "spinning" of a news story. This means enhancing the value of a particular message.

Experience in news broadcasting shows that it's crucial not only to find the news itself, but also to be able to promote it, generating excitement and public agitation. This will enhance its impact, achieve its goal, and boost the channel's ratings.

Comparing finishing with infotainment, the latter makes the news more prominent, expanding its informational and newsworthy scope, while finishing allows for a deeper dive into the situation. A television journalist is like an oil producer, developing oil reservoir after reservoir. After all, journalism is not an art whose inherent property is fiction. It is also more complex because, unlike art, the truth of life coincides with the truth of fact.

Modern television news journalism is not simply about reporting current events, but the ability to work with facts, develop the information received, and present it in a way that is memorable to viewers. In this context, news promotion is effective.

It should be noted that just a few years ago, it was believed that news promotion was unnecessary, since viewers knew when it would air. Today, audiovisual media professionals understand that promotion is an excellent means of increasing the ratings of news broadcasts.

Let's analyze the most effective types of promotion for television news products.

Image promotion is how a television channel wants viewers to perceive it. The editorial staff strives to convey an image, an impression of how the news program is compiled. Therefore, the news program must correspond to this image and reinforce it with daily practice. If a TV channel has the opportunity to promote a news program, it should choose a time slot that will attract as many viewers as possible. If the news program airs during evening prime time, it makes sense to schedule the promo before the news, as is done on the country's leading television channels. Another possible location is morning prime time. When editing such a promotion, excerpts from field reports and studio-recorded segments are typically used.

The next type of news promotion is a thematic promo. Typically, this is an advertisement for a story—one or more—that will be broadcast during the news program, such as a special report. Such an advertisement typically includes a highlight video clip from the report to be aired during the news program. Experts recommend placing such a story at the end of the program so that viewers can watch other news while waiting for it [17; 92].

The third type of promotion is a high-quality one. This type of promotion is usually included after the news broadcast. This could be a reminder for viewers or a summary. For example, a TV channel's news service announces that it is switching to a different operating mode or has changed its broadcast schedule, and news will be broadcast at a different time. One way to create a high-quality promotion is to leverage the opinions of the target audience, city residents, and passersby on the street. Their authoritative opinion on the quality of the news programs will convince others more than any words from the presenters.

Besides on-air news promotion, there are many other ways to attract attention to news broadcasts. These include badges, T-shirts with slogans, stickers, and keychains with the logo and phone number of the television company or its news service. These are given to interviewees, for example.

Another promising area of television news reporting is campaigns. These are actions taken to achieve a specific goal. In television journalism, campaigns typically have a humanitarian focus. Their goal, like the goal of all journalism, is to help people. Television campaigns have multiple stages. Typically, they consist of:

1) announcement of the start of the campaign (the launch);

2) sponsorship promotion (intermediate stage);

3) summing up.

It is becoming increasingly clear that example of a campaign in television news programs is the "Dobro" campaign on Channel One. This is a joint campaign by Channel One and the Russian Foundation for Dissemination of Good. It is periodically featured on the "Vremya" news program, and proceeds from viewers go toward the treatment of seriously ill children [26]. Similar campaigns are also periodically organized by regional Russian television channels. For example, "Vesti. Novosibirsk" broadcast on April 30 of this year featured a story about 8-year-old Timofey, who suffers from cerebral palsy and needs help [27]. Unfortunately, such campaigns are not held on national television channels in Uzbekistan.

Among the effective forms of news presentation, the clip headline is noteworthy. In television news broadcasting, headlines for all news stories are typically constructed according to traditional press models (narrative headline-message, headline-quote, headline-summary, compound headlines, appeal, appeal, exclamation, headline with "continuation," with a colon, playful headline, etc.). A clip-based headline is a form of emphasis, achieved through any means: underlining, increasing the size, changing the font of a keyword, intonation, etc. For example, the headlines of the "Vesti" news program sometimes take the form of clip-based headlines: "Five-Star" Grandma" ["Vesti. Novosibirsk" from April 24, 2026], "Drone Hunting Over the Dnieper," "Euro-Tranche for Ukraine: Reforms Under Pressure" ["Vesti" from April 29, 2026], etc.

The so-called "packaging" of a news broadcast plays a significant role in the presentation of news. "Packaging" is everything that presents the news program to the viewer. This concept includes the logo, news intro, color scheme, studio design, computer graphics, etc.

The logo of the Russian program has remained unchanged for several years: the word "Vesti" in pale blue on a bright blue background. The news sign and studio design have undergone a makeover: the bright blue colors that have dominated the program's design for many years have given way to a new color scheme—soft, sky-blue and blue tones. The sign perfectly harmonizes with the studio's color scheme. The set has become more modern: the steel frames of the desks behind which the anchors of the news program "Vesti" sit represent the continuous conveyor of information flowing into the studio, and the shimmering blue "panorama" in the lower right corner of the studio image attests to the constant flow of information. In contrast to the steel color of the "waist" desk behind which the anchor sits, the logo, the sign, and the studio's overall understated design emphasize the seriousness and thoroughness of the program.

The Uzbek program "Poytaxt" has also undergone a design overhaul. The studio's gray tones have been replaced by a calming blue. This color scheme is a welcome change. The combination of various shades of blue creates a positive atmosphere, not overwhelming or tiring, but invigorating and relaxing. Shades of light blue and blue symbolize inner strength and harmony. The freshness of these colors, combined with their calming influence, makes them desirable, as they relieve stress and promote a calmer perception of the information being conveyed. A contemporary style is also evident here: the pedestal behind which the presenters sit is made of plastic in the same color as the studio's decor, its irregular shape creating a sense of diversity and multifacetedness.

It's worth noting that both news programs make minimal use of infographics, such as maps, diagrams, or charts. The active use of infographics is more typical of Western European TV channels such as Euronews, France 24, Sky News, and others. Infographics are also common on the Uzbek TV channel UzReport.

The news programs "Poytaxt" and "Vesti" also share the use of titles, interludes, and announcements (spiegels). Both programs begin with spiegels—announcements of the program's

contents. Spiegels use a condensed presentation of the main points of the stories, outlining the timeframe of the event and its main characters. The purpose of spiegels is to facilitate comprehension "by fragmenting information and drawing viewers' attention to the program" [13;173].

The intro to "Poytaxt" is a musical background with a rhythmic, rapid beat. The stories are announced by the program's correspondents at a fast tempo, with restrained but emotional voiceovers. The presentation of information on the program "Poytaxt" is strict and somewhat formal. Stand-up comedy is practically nonexistent.

For viewers of the program "Vesti," news is presented in a more personalized, emotional, but unbiased manner. Brief, precise summaries and textual "connections" between stories make the news program on the Rossiya-1 channel not only more digestible but also more comfortable for the viewer.

Personification can also be considered a distinctive feature of modern television news programs. In this regard, the "Vesti" news service, where the technique of personification has been further developed, is an advantage.

The concept of news personification is considered not only in terms of its content, where journalistic materials focus on people, their feelings, fates, and experiences, but also in terms of the presentation and form of the information materials. In this sense, stand-up comedy, as well as the constant, persistent "advertising" of its own reporters, can be considered formal signs of personification.

A typical example of this technique on the evening program "Vesti" is the newscast previews (spiegels), which feature correspondents, as well as the numerous stand-up routines that are given considerable time in news segments.

Regular viewers of "Vesti" know the reporters by sight, recognize their voices, and even their creative style. The work of journalists on the program "Poytaxt," unfortunately, is less individualized.

We believe that this method of personalization has a positive impact on audience trust in the source of information, since by trusting a specific reporter, a personalized source, the audience is more interested in the information itself.

Experts note that the unity of a TV station's visual image is achieved through the correct combination of graphic techniques, digital video effects, and electronic captions throughout each broadcast day [14;112]. One effective way to harmoniously combine all of these elements is to create a distinctive graphic "backdrop" for news programs. For example, in the "Vesti" program, the backdrop features the most striking sections of the story, the introduction to which is spoken by the presenter. Since the graphics are consistent with the overall image of the Rossiya-1 channel, they effectively highlight the presenter's text, illustrate it, and attract the attention of those viewers who were only half-watching the program. Seeing a successful visual image on the backdrop, they are likely to approach the television and turn up the volume or do the same on the remote control. A well-designed graphic design for the "Vesti" news program not only adds dimension to the studio set but also emphasizes the fact that news is the most important part of the channel's broadcast.

In the news program "Poytaxt," previews of upcoming stories are presented in a multidimensional image of rapidly changing cubes containing clips of the most interesting segments of the broadcast. Viewers associate the receding corridor of broadcast events with an endless stream of news reports, directing our attention deeper into the events and phenomena being covered.

Therefore, the increasing multichannel nature of modern television and the competition between channels inevitably impacted news—the core of virtually any television company. Stylistic unity, efficiency, and a commitment to comprehensive and objective coverage—all of these have become the hallmarks of the news programs "Poytaxt" and "Vesti," defining their niche positions in the TV news space. Unlike many modern news programs, such as "Segodnya" (NTV) and "Vestnik" (TNT), both programs do not focus on human tragedy. Their principle of news ranking is to give the audience an objective understanding of current events in the world and the country.

Furthermore, the creators of the programs "Poytaxt" and "Vesti" avoid excessive dramatization. They strictly adhere to the principle of separating facts from opinions. No "yellow press" was observed in the programs we analyzed. Both programs rely on the competence of their presenters, correspondents, and reporters.

Conclusion. Thus, it can be concluded that the methods of presenting information in modern news broadcasting have changed: they have become more original, engaging, and sometimes entertaining. The way news is presented has also evolved: for example, reports have begun to emphasize details of interest to viewers. Many television channels are forced to shift the emphasis of their news programs from political and official information to coverage of pressing social issues, scandalous and bizarre stories, cultural events, and the like.

It cannot be overlooked that the study showed, unlike foreign television companies, Uzbek television news programs do not veer sharply toward entertainment; they are more carefully crafted and balanced.

It should be pointed out that many television channels employ news delivery techniques such as "infotainment," "event action," "finishing," "headline"-type events, "hard news," "soft news," and others. Many TV news programs emphasize spectacle, clip-like plots, concise and dynamic presentation, complex editing, high tempo, and rapid image changes.

The plots of many news programs are quite open-ended and sometimes extend beyond the scope of standard information. Such news delivery techniques require careful and competent use by television journalists.

For increasing viewer attention to the news, news producers have begun to employ marketing specialists who are developing new concepts for presenting information using simplified stories, "light" topics, rich visuals, and increased emotionality in the delivery of materials.

In light of the above, it seems advisable to:

- prioritize the quality of news releases over quantity;
- organize news releases based on audience needs, not to cater to the "official";
- more frequently incorporate live broadcasts, stand-up specials, on-the-spot phone interviews, breaking news reports, and vox pop into the structure of news blocks;
- skillfully alternate between "hard" and "soft" reporting;
- pay more attention to news packaging, graphic techniques, digital video effects, electronic captions, etc.;
- promote the further development of personalization in news releases and the promotion of reporters and correspondents;
- utilize news promotion effectively.

In the final analysis, it becomes clear that there are no trivial details in the work of news programs. Everything is important here: the layout of the issue, the construction of individual

stories within it, the headlines, the introductions, the development of the news story, and its promotion. No less significant, as we have seen, is the thoughtful use of a variety of methods for delivering information to the audience.

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REVIEW OF THEORIES OF SOCIAL BEHAVIOR DEVELOPMENT IN ENTERPRISES AND ITS INFLUENCE ON MANAGERIAL DECISION-MAKING

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Abstract. *This article reviews major theories of social behavior development in enterprises and explains their influence on managerial decision-making. It examines organizational development, bureaucracy theory, human relations theory, contingency theory, systems theory, organizational culture, and game theory as interconnected approaches to understanding change in modern organizations. The study emphasizes that successful managerial decisions depend not only on formal structures and technologies but also on employee behavior, motivation, trust, cooperation, resistance to change, and leader–follower interaction. Special attention is given to planned change, transaction costs, organizational equilibrium, and the role of behavioral models in improving organizational effectiveness. The article argues that game theory provides a useful methodological basis for modeling managerial strategies and employee responses because it considers both economic and behavioral factors. The findings show that digital transformation of decision-making can integrate predictive, prescriptive, behavioral, and socio-cultural management models at enterprise and sectoral levels under conditions of uncertainty, competition, and change.*

Keywords: *organizational behavior; organizational development; managerial decision-making; game theory; organizational culture; behavioral models; digital transformation.*

Introduction

People and their organizations exist in a state of continuous evolutionary development, where constant change, adaptation, and improvement are essential for survival and growth in a rapidly transforming world. The modern environment of unprecedented uncertainty and chaos surrounding organizations establishes new criteria for their functioning. Intense competition and severe conditions for survival in an increasingly globalized market, stricter social and environmental requirements, unpredictable political situations, the threat of terrorism, the growing gap between the GDPs of the richest and poorest countries, unstable financial markets, tightening legal regulations, and the increasing customer demand for alternatives, superior quality, and convenience on the one hand, together with the technological revolution, worldwide telecommunication services, a record number of mergers, acquisitions, joint ventures, and partnerships, the globalization of business and finance, and international economic and trade regulation on the other hand, represent the realities of the modern organizational environment. These factors are interconnected and rapidly changing, creating an extremely uncertain and chaotic environment for all types of organizations in both the manufacturing and service sectors, as well as in the public and private sectors (Peters, 1987). Organizations seeking growth must continuously transform in order to adapt to such a turbulent environment. “They evolve and change in many ways. Their structures, missions, purposes, and levels of activity are among the most important

elements of this process. Outdated structures, goals, missions, and activities indicate the need for change and possibly a transition to new forms and/or systems" (Korth, 1998).

Literature Review

Change is the only constant defining the life of a modern organization. Management guru Peter Drucker argued that choosing change means the systematic and purposeful abandonment of an organization's existing theory of business; otherwise, organizations risk becoming trapped by unfolding events. Before deciding which strategic change should be implemented within an organization, it is necessary to understand how such change can be effectively carried out (Drucker, 1994). Research and analyses of business literature over the past thirty years concerning organizational change indicate that nearly 70% of change initiatives ultimately fail (Ewenstein et al., 2015).

Any organization can be viewed as an open-system model consisting of several internal subsystems. Each system and/or subsystem possesses its own inputs and outputs, and these are generally interdependent. Based on this systems approach, interventions are classified and designed according to the organizational problems they are intended to solve and the organizational levels they primarily affect (Cummings & Worley, 1993). One method of classification is the specification of interventions according to four major interrelated organizational issues: human process issues, technology and structural issues, human resource issues, and strategic issues. These dimensions determine the types of challenges that organizations must address in order to function effectively. Since organizations operate as systems composed of interdependent subsystems, these issues are interconnected and must be integrated into the organizational development (OD) process.

The result of any business process is measured economically, and the process of change is no exception. The overall economic efficiency of change depends on the transaction costs of organizational members, which primarily reflect the level of trust within the organization. The level of trust is determined by organizational culture. An effective organizational culture possesses a strong moral foundation. Morality generally enables organizations to solve complex problems related to change that formal procedures alone cannot resolve. Thus, a strong organizational culture helps overcome resistance to change, thereby reducing transaction costs and increasing productivity. Consequently, the success of an organization depends on the quality of its culture.

Regardless of the level of intervention in the change process and the problem intended to be solved, organizational employees participate in the implementation of planned changes. The success of the organizational development process depends on how well the relationships between the change leader and followers are organized, as well as on the extent to which a productive behavioral climate has been created within the organization. Improper formation of a climate for change may lead to the failure of even the most carefully designed intervention process due to a lack of understanding of the need for change and unwillingness to overcome resistance to change among organizational members, including both employees and managers. Therefore, understanding the transactional economics between the parties involved in the process, anticipating the problems of managing planned change, and creating the most favorable climate for cooperation are the key factors for successful change intervention.

Materials and Methods

This study employs concepts primarily used in the disciplines of organizational development and game theory.

"Organizational Development (OD) is a process through which behavioral science knowledge and practices are used to improve organizational effectiveness, including the enhancement of quality of life, labor productivity, and the quality of products and services. … the primary focus is placed on the organization's ability to assess and solve its own problems" (Drucker, 1994). Change should be understood as a planned process of transformation, initially designed with specific objectives in order to benefit organizational members in the long term. It differs from unplanned change, which usually represents a short-term organizational response to external market shocks, during which all organizational members may suffer losses in order to preserve organizational stability. Organizational development methods are used for two main purposes: improving the organizational climate and increasing organizational effectiveness (Larwood, 1984).

According to game theory, a game is an economic and/or behavioral process involving two or more parties with their own objectives and corresponding strategies, who exchange economic and/or emotional values that may be gained or lost depending on the outcomes of the process. A strategy is a set of actions that must be carried out before the completion of one round, after which the results are evaluated. A cooperative game is one in which all players are informed about the payoffs of their partners; otherwise, it is a non-cooperative game. An asymmetric game is a game in which the partners' payoffs under a given strategy are unequal, or where one player's gain is not necessarily another player's loss. Information asymmetry occurs when players possess different levels of knowledge regarding the payoffs of their partners and their preferred strategies.

A leader is defined as a manager or a group of managers implementing change interventions. Followers are employees or groups of employees who are required to modify their behavioral positions in order to accept new norms. The leader generates resources, whereas the followers produce resources. The leader's consumption is associated with the expenses related to his or her activities. The parameters of the change game are the settings that determine the input data of the change process, such as the size of incentives, the scale of projected growth, the leader's consumption expenditures, and the perceived cost of effort. The state of the change game is a set of conditions representing relatively measurable values that determine the current situation of the change process, such as follower sensitivity, feelings of guilt, and the level of disobedience, which are derived from the parameters of change.

Organizational equilibrium is a game state in which the organization achieves its maximum payoff. Equilibrium sensitivity refers to changes in the state of equilibrium depending on changes in input data and parameter values.

Results and Discussion

Specialists in organizational development identify three key elements of organizational development: improving organizational effectiveness; humanistic psychology — a theory asserting that an organization consists of a group of interconnected individuals with internal needs for psychological growth; and organizational development grounded in the social sciences (Smither ed., 1996).

Organizational development, or the management of planned development, has become a subject of great interest in modern organizations facing intense competition in both domestic and global markets. As the market evolved through the sequence of "domestic – international – global," OD practices followed this progression in order to meet organizational needs. These studies were aimed at identifying the conditions under which employees and management could cooperate and,

consequently, become more productive (Cummings, 1993). Researchers discovered that social relations played a fundamental role in the workplace (Roethlisberger et al., 1939).

Other OD experts associate laboratory training with the beginning of the OD era. Laboratory training, known as basic skills training groups or T-groups, was introduced by Kurt Lewin and his colleagues at the Massachusetts Institute of Technology (Smither ed., 1996). These T-group experiments were highly significant for the development of OD because they focused on problems related to communication and relationships among group members.

In order to facilitate intra-organizational communication, survey feedback interventions were introduced. In particular, Rensis Likert studied human processes within organizations, such as employees' perceptions of their supervisors, opportunities for career advancement, and satisfaction with group work, as well as the corresponding reactions of middle managers and information received from top management (Likert, 1932; Drucker, 1994).

Similar to action research aimed at implementing change, several change management projects focused on improving productivity and the Quality of Work Life (QWL). This approach was applied during change implementation experiments to examine the value chain and organizational architecture, as well as their interrelationships (Trist, 1951). QWL practices led to the development of the sociotechnical approach by the same institute. The foundation of this idea is the fact that every organization consists of both social and technological systems, and changes in one system result in unintended changes in the other (Smither ed., 1996). Both action research and sociotechnical systems approaches were developed to understand the relationship between employee behavior and the work environment, and to enable development agents to design the most appropriate work processes for improving productivity and employee satisfaction.

At present, the scope of QWL programs has expanded beyond the individual approach and now includes aspects of job design such as reward systems, work processes, management styles, and the work environment. Accordingly, these practices are widely applied to further enhance organizational effectiveness.

Organizational culture is based on the perceptions that organizational members hold about themselves, customers, competitors, and society, and it reflects their shared beliefs and values. When these perceptions, beliefs, and values are widely shared among organizational members, the culture is considered strong (Smither ed., 1996). The cultural environment of an organization includes accepted patterns of behavior (formality versus informality), roles (managers versus subordinates), and norms (punctuality versus flexibility). Roles are expected patterns of behavior associated with a person or his/her position. For example, managers are expected to act as leaders, while subordinates are expected to act as followers during the change process. Norms are established rules governing people's behavior within the organization. Organizational culture has become a central element in the development of any organization; however, it is also the most complex component and the primary source of resistance to change implementation, which is why it responds very slowly to change. According to the sociotechnical systems approach, changes introduced into the organization's value chain entail and/or require changes in the social system, especially in organizational culture. Strategic changes were designed to respond to this tendency and to integrate efforts aimed both at improving the organization's relationship with its environment through open-system planning and at strengthening the links between technical, political, and cultural systems, as well as transforming organizational culture (Beckhard, 1987). It should be noted that such strategic changes are usually triggered by major organizational shifts,

such as deregulation, technological breakthroughs, or the arrival of a new external leader (Miller, 1980).

There are three major theories that are particularly significant in organizational theory and are classified according to different approaches to organizations and the factors influencing organizational development (OD):

The theory of bureaucracy proposed by Max Weber (Weber, 1947) assumes that organizations function effectively when fair rules and procedures are established to regulate every possible situation. Bureaucracy emphasizes organizational structure and procedures that change slowly and are applied equally to everyone. Therefore, organizational change interventions are reduced to the task of recreating new structures and work procedures while minimizing or eliminating existing ones, often ignoring or reducing the role of individuals in implementing change.

In contrast to the theory of bureaucracy, the human relations theory emerged from the aforementioned humanistic psychology approach (Maslow, 1954; Likert, 1961; McGregor, 1960). According to this theory, improving interpersonal communication leads to greater organizational effectiveness. Thus, organizational change resembles individual psychological improvement: the most effective changes occur at the level of individuals and work groups rather than through top-down directives.

The most recent organizational approach, contingency theory (Lawrence, 1967), unlike the two theories mentioned above, argues that neither structure nor people are the sole determinants of organizational effectiveness. Instead, the macroeconomic environment determines the organization’s position, and therefore successful organizations develop their structures and cultures by learning from and adapting to external factors. Proponents of contingency theory argue that there is no universal type of organization suitable for all conditions, and each organization must develop its own model in order to remain sufficiently flexible to adapt to changing environmental conditions.

In practice, organizations use various combinations of all three approaches to build their structures throughout their existence.

The widely recognized change model of Kurt Lewin is one of the earliest fundamental models of planned change (Lewin, 1951). This model views the organization as a behavioral system consisting of two forces involved in the change process: those promoting change and those resisting change in an effort to preserve the status quo. Lewin described the state in which these two forces are equal as “quasi-stationary equilibrium,” and consequently current organizational behavior is maintained. The planning model emerged as a result of a more comprehensive attempt to model the process of planned change (Lippitt et al., 1958). According to the action research model, such a cyclical process of planned change consists of two main stages: knowledge generation and change implementation (Kolb, 1970).

David Hussey presented change management as a six-stage interconnected process (Hussey, 2000). According to this approach, change management activities are classified into motivational and leadership tasks, as well as administrative tasks. Motivational and leadership tasks are aimed at inspiring people, reducing resistance, and ensuring broad participation, while administrative tasks are intended to clarify the action plan and evaluate achievements. Notably, the former tasks imply a human relations approach and are quite accurately described through game theory methods.

Understanding organizational culture is crucial for assessing the level of resistance that a change intervention is likely to encounter (Harvey, 1988). According to this model, the level of resistance depends on the extent of change and its impact on organizational culture.

The application of open systems theory (Likert, 1932), systems theory (Thayer, 1974), living systems theory (Vancouver, 1996), chaos theory (Thietart, 1995), complexity theory, and game theory in strategic change applications has had a significant influence on the development of OD practice. Open systems theory views the process of planned change as an intervention aimed at establishing an optimal equilibrium between the interconnected organizational system and its external environment. In this context, the ideas of sociotechnical systems (Cummings, 1977), self-organizing organizations (Cummings & Mohrman, 1987), and transorganizational development (Cummings, 1984) provide noteworthy examples of the application of this theory.

Systems theory, complementing open systems planning, considers the organization and its environment as an integrated unique system with interconnected subsystems, where the subsystems themselves consist of lower-level subsystems. The ideal implementation of this theory leads to a computational deadlock (Greene, 1999).

It is evident that any advanced organizational structure and sophisticated technologies are meaningless unless the people within the organization, from managers to employees, fit into and/or accept the designed technostructural system. On the other hand, the technostructural system must be designed to respond positively to people's aspirations for personal growth. Any technostructural shift in organizational functioning should therefore be accompanied by the development of human resources and interpersonal relationships. Thus, the development of human relations should be regarded as a key process in any planned change initiative.

Since motivation and, consequently, employee participation are vital to the success of interventions, change leaders must understand people's perceptions of motivation. Theory X and Theory Y characterize simplified methods of motivation. Managers applying Theory X assumed that they were somehow superior to others, self-motivated, while employees were lazy, unmotivated, avoided difficulties, and disliked responsibility. Consequently, the main task of such a manager was to control employee behavior through a carrot-and-stick policy, namely rewards and punishments. Such managers likely failed to understand that others are motivated in much the same way as they themselves are (Larwood, 1984).

Transactional analysis, an interpersonal-level change intervention, aims to transform organizational culture by increasing people's awareness of their interpersonal interactions (Berne, 1961). The transactional analysis approach is mainly based on game analysis designed to study the underlying motives in interpersonal interactions (Smither ed., 1996). In this context, a game is understood as a hidden interaction carried out to reinforce a negative position toward others, being manipulative in nature and involving emotional gain. However, this approach is limited exclusively to the psychological aspects of personality.

"Game theory has achieved success in recent years because it fits perfectly into the new methodology of economics" (Rasmusen, 2002). Game theorists expanded this transactional analysis into transaction cost analysis. From the perspective of game theory, a game is a process in which several parties possess their own goals and action strategies, and its outcomes depend on how the parties interact, while gains or losses are distributed among them. The parameters and outcomes of a game may have both quantitative and qualitative values; therefore, both the economic and emotional aspects of the process can be effectively modeled and the results evaluated. In reality, individuals and groups are guided not only by emotional motives but

predominantly by economic benefits, since the economic component dominates human behavior. Game theory is a flexible tool for modeling transactional processes not only between individuals or groups but also at any level and within any diversity of socio-economic processes where different parties pursue their own objectives, regardless of whether they compete or cooperate. Researchers have widely applied game methods to study economic behavior and organizations. While studying leader–follower relationships, Mark Casson analyzed business transactions as a trading process, examined the cultural influence on the behavior of trading participants, and attempted to synthesize a model of business culture at the national level for the modern market economy (Casson, 1991). As a result, he concluded that the moral principles and culture of individuals genuinely influence economic performance and, through mathematical analysis, demonstrated that an altruistic and cooperative business culture enables higher productivity. A hypothetical study in the field of non-selfish economics also proved that people benefit more from building a cooperative and altruistic culture than from remaining in a selfish, economically rational environment (Collard, 1981). Empirical studies further indicate that the presence of altruistic preferences may also be significant for the optimal provision of public goods (Russell ed., 2003). Such studies are impossible within other theories based solely on technostructural ideas.

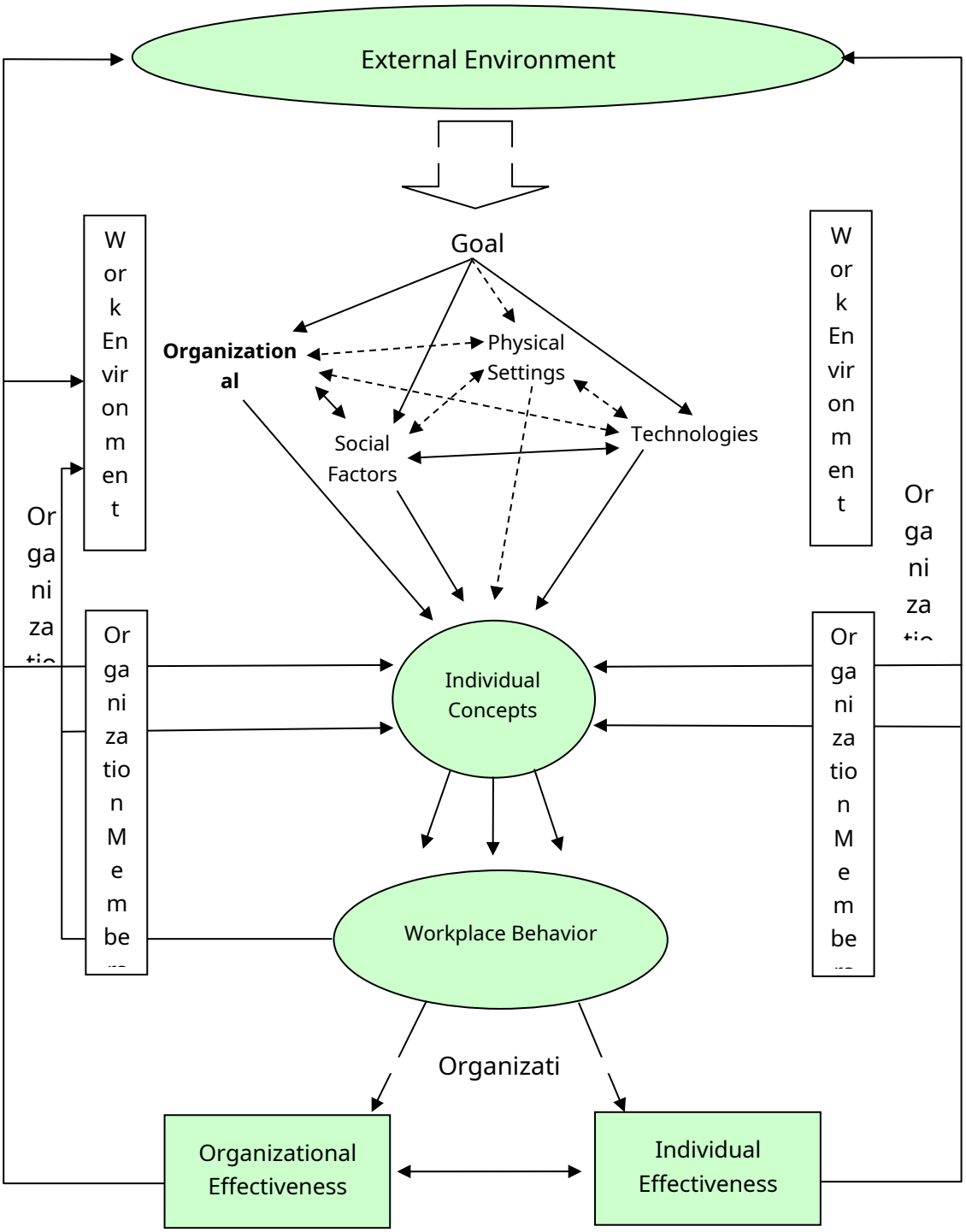
Research on transactional processes at the interpersonal level has shown that competitive employee reward preferences, namely incentives, are more important for employee satisfaction, including job satisfaction and social satisfaction (Charness & Grosskopf, 2001).

Many factors influence organizational effectiveness, but the most important among them is the behavior of the individual employee (Smither et al., 1996). Studies of organizational architecture have revealed the existence of two primary organizational outcomes: organizational effectiveness and individual development (Porras & Robertson, 1992). These outcomes are the product of workplace behavior formed through individual thinking, which is influenced by organizational members, norms, technologies, as well as personality-specific and external factors. Organizational vision is developed in order to shape a coordinated internal environment. The change-based organizational structure model (Figure 1) illustrates the interdependence of the internal and external environments of the organization as an integrated system.

The model presented below considers organizational behavior as the most important factor in achieving organizational outcomes. However, the role of the leader as a factor influencing the development of organizational behavior is not taken into account in this case. Supporting the ideas presented above, change agents should view organizations as systems composed of interdependent subsystems. Thus, changes in one part are likely to affect other areas as well. Since an organization is an open system, people’s behavior, developing within a particular framework, is constrained by established organizational rules and norms while simultaneously interacting with other internal parts of the organization and the external environment, including national culture and economic conditions.

In conclusion, it should be noted that organizational employees become the central focus of organizational development efforts because they are involved in changes that cannot be implemented without their participation and because they represent the primary source of resistance to change. Ultimately, they are the ones who benefit most from successful interventions and suffer losses from failures resulting from organizational development initiatives. The following sections present several methods for modeling human relations and developing appropriate managerial behavior that facilitates the implementation of organizational development interventions.

Figure 1. Change-Based Organizational Structure



A series of experiments conducted in small communities revealed convincing evidence that prosocial norms of fairness and reciprocity are strengthened through greater market integration. The intuitive logic behind this finding is compelling. Greater market integration weakens the strong mechanisms of social enforcement characteristic of small communities, thereby increasing the likelihood of opportunistic behavior. Recognizing this and seeking to benefit from a greater division of labor, exchange participants encourage qualities such as fairness and reciprocity in their interactions with strangers while simultaneously punishing instances of unfair behavior. Accordingly, greater market integration reinforces prosocial norms toward strangers (Boyd et al., 2005; Henrich et al., 2006; Henrich et al., 2010). However, when examining market integration,

researchers focused exclusively on the role of informal institutions, such as mechanisms of social enforcement, in structuring and regulating exchange in rudimentary societies (Smither et al., 1996).

Various scholars provide evidence of the role of social norms of fairness, reciprocity, and honesty as forces balancing motives of self-interest. For example, evidence of honest behavior has been studied through observations that people appear to tip equally in local restaurants (presumably to encourage better future service) and in taxis (where the probability of repeat interaction is minimal) (Peng, 2003). Under experimental conditions, offers in the ultimatum game typically range between 40–50% of the total stake, and responders generally reject offers below 20% (Camerer, 2003). Likewise, participants in dictator game experiments usually make positive offers even when recipients have no opportunity to reject the proposed allocation (Forsythe et al., 1994). Similarly, some researchers regard tax reporting (Wenzel, 2004), returning full wallets to police stations (West, 2005), disclosing billing discrepancies favorable to oneself to suppliers (Frank et al., 1993), and returning fully addressed and stamped "lost letters" containing money to their rightful owners (Zsolnay, 2003) as manifestations of honesty. Based on the above, an important question arises: will prosocial behavior be stronger or weaker in more market-oriented economies?

There are intuitive arguments supporting both positions. On the one hand, a number of scholars argue that norms of fairness, reciprocity, and honesty are likely to be stronger in more market-oriented economies with more developed formal institutions for three main reasons. Part of the purpose of researching game-based behavioral models at both the national and enterprise levels is to expand this field of study in both dimensions in order to determine whether prosocial behavior is stronger or weaker in more market-oriented economies and within individual enterprises themselves. First, the research expands the focus to include extensive markets where exchange transactions are more ephemeral and anonymous (Platteau, 2000), thereby examining predispositions toward fairness and honesty in situations where the benefits of trade increase while mechanisms of monitoring and social enforcement become correspondingly weaker (Kandori, 1992). Second, by explicitly including formal institutions that simultaneously develop to support exchange in extensive markets, it becomes possible to investigate whether prosocial behavior is crowded out by more developed market-compatible formal institutions (Bowles et al., 1997; Frey & Oberholzer-Gee, 1997; Reeson & Tisdell, 2008).

Conclusion

This study develops a separate theoretical approach to the modeling and consistent digital transformation of management and decision-making in organizational development, taking into account the behavioral parameters of leadership strategies and employee behavior on the basis of game theory methodology.

The conducted analysis of theories and the proposed approaches to the digital transformation of decision-making demonstrate that various aspects of enterprise and industry management — ranging from predictive and prescriptive models of business processes to behavioral and socio-cultural management processes — can be successfully modeled and integrated into digital decision-making systems not only at the enterprise level but also across entire sectors of the economy.

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PSYCHOLOGICAL AND SOCIOLOGICAL DIMENSIONS OF TEXTUAL DESIGN IN YOUTH FASHION

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Abstract. *This article examines the psychological and sociological aspects of text-based design in youth clothing within the context of contemporary fashion culture. The study explores the role of textual elements, slogans, and typographic compositions as instruments of self-expression, social communication, and identity formation among young people. Particular attention is given to the psychological influence of text-based clothing on emotional perception, self-confidence, motivation, and behavioral attitudes. In addition, the research analyzes the sociological significance of textual fashion design in shaping youth subcultures, social belonging, and collective identity in the digital era.*

The paper also investigates the relationship between typography, color psychology, visual communication, and consumer behavior in modern youth fashion. Contemporary fashion trends, including streetwear aesthetics, minimalist typography, and social media-driven clothing culture, are examined as influential factors in the development of text-based apparel design. Furthermore, the study highlights the impact of digital technologies and sustainable fashion approaches on the evolution of youth-oriented clothing design.

The findings demonstrate that text-based clothing has evolved beyond its decorative function and has become a powerful communicative and symbolic medium reflecting personal values, emotions, and social perspectives. The research emphasizes that the integration of psychological principles, sociological analysis, and innovative design methodologies plays a crucial role in the creation of effective and aesthetically appealing youth fashion products.

Keywords: *youth fashion, text-based design, slogan clothing, typography, visual communication, fashion psychology, social identity, youth culture, self-expression, sociological aspects, consumer behavior, streetwear fashion, emotional branding, clothing design, contemporary fashion.*

Introduction

In contemporary society, fashion has evolved beyond its traditional functional purpose and has become a significant medium of communication, self-expression, and social interaction. Among modern fashion trends, text-based design in youth clothing occupies a distinctive place due to its ability to convey emotions, personal beliefs, social values, and cultural identities through textual and typographic elements. Slogans, graphic inscriptions, and expressive typography integrated into clothing design have become increasingly popular among young people, particularly within streetwear, casual, and urban fashion cultures.

The growing influence of globalization, digital communication, and social media platforms has significantly transformed youth fashion preferences and consumption patterns. Modern young consumers tend to select clothing not only for comfort and aesthetics but also for its symbolic and communicative value. Text-based clothing allows individuals to express their identity, worldview,

emotional state, and social attitudes. As a result, fashion products containing slogans and textual compositions function as visual communication tools that reflect psychological and sociological dimensions of youth culture.

From a psychological perspective, textual elements in clothing design influence emotional perception, self-confidence, motivation, and behavioral expression. Motivational slogans, inspirational phrases, and minimalist textual compositions can positively affect an individual's mood and personal identity formation. In addition, the combination of typography, color psychology, and graphic composition contributes to the emotional and visual impact of fashion products. Young consumers often associate specific textual messages with individuality, freedom, creativity, and social belonging, which increases the psychological significance of text-based apparel.

From a sociological standpoint, youth clothing serves as an indicator of social identity, cultural affiliation, and group interaction. Text-based fashion design reflects the values and ideologies of contemporary youth subcultures, including streetwear communities, hip-hop culture, skateboarding culture, and digital fashion movements. Social media platforms such as Instagram, TikTok, and Pinterest play an essential role in popularizing slogan-based fashion trends and shaping consumer preferences through visual content and influencer marketing. Consequently, clothing has become a symbolic medium through which young people communicate social positions, lifestyle choices, and collective identities.

Furthermore, advancements in digital technologies and sustainable fashion practices have introduced new opportunities in the development of text-based youth clothing. Innovative typography techniques, digital printing technologies, AI-generated graphic concepts, and environmentally sustainable materials contribute to the modernization of fashion design processes. These developments demonstrate that text-based fashion is not only an aesthetic phenomenon but also a multidisciplinary field connected with psychology, sociology, communication studies, and consumer behavior research.

This article aims to analyze the psychological and sociological aspects of text-based design in youth clothing by examining its communicative functions, emotional influence, social significance, and role in contemporary fashion culture. The study also explores the relationship between typography, visual communication, consumer psychology, and youth identity formation in modern apparel design.

Psychological Aspects of Text-Based Design in Youth Clothing

In modern youth fashion, text-based clothing has become an important form of psychological expression and emotional communication. Contemporary young consumers often use clothing not only as a functional necessity but also as a visual representation of their personal identity, emotional condition, beliefs, and social values. Textual elements such as slogans, motivational phrases, and graphic inscriptions influence both the wearer and the surrounding audience through symbolic and emotional interaction.

One of the primary psychological functions of text-based fashion is self-expression. Young people frequently select clothing with specific textual messages in order to communicate individuality, creativity, independence, and personal attitudes. Fashion products containing inspirational or emotionally charged phrases may contribute to increased self-confidence and positive emotional perception. For example, slogans such as “Stay Strong,” “Dream Big,” and “No Limits” are associated with motivation, optimism, and self-development.

Furthermore, text-based design plays a significant role in identity formation among youth. During adolescence and early adulthood, individuals actively seek ways to construct and present their social image. Clothing containing symbolic textual messages helps young consumers distinguish themselves socially and visually. In this context, typography and slogan placement become psychological tools for representing individuality and emotional state.

Color psychology also has a considerable impact on the perception of text-based clothing. The combination of typography and color creates emotional associations that influence consumer behavior and aesthetic preferences. Dark colors such as black are commonly associated with authority, confidence, and rebellion, while white reflects simplicity and minimalism. Bright colors, including red and orange, symbolize energy and activity, whereas blue tones are linked with calmness and emotional stability. Therefore, designers must carefully consider color combinations when developing youth-oriented text-based apparel.

Another important psychological factor is emotional branding. Modern fashion brands increasingly use textual messages to establish emotional connections with consumers. Clothing containing meaningful slogans creates a sense of belonging and emotional attachment, encouraging customer loyalty and social engagement. As a result, text-based fashion design has become an effective instrument of psychological influence within the contemporary apparel industry.

Sociological Aspects of Text-Based Clothing Design

From a sociological perspective, clothing functions as a social symbol reflecting cultural values, social identity, and group affiliation. Youth fashion, particularly text-based apparel, serves as a medium through which young people communicate their social positions, interests, and lifestyle preferences. Slogans and graphic texts on clothing often represent collective beliefs, social movements, and cultural trends within contemporary society.

One of the most significant sociological dimensions of text-based fashion is social identity formation. Young individuals frequently use clothing to demonstrate their connection to specific subcultures or social groups. Streetwear fashion, skate culture, hip-hop aesthetics, and digital youth communities actively incorporate text-based design as a form of symbolic communication. Through slogans and typography, clothing becomes an indicator of shared values and collective identity.

In addition, globalization and digital communication technologies have transformed the sociological role of fashion. Social media platforms such as Instagram, TikTok, and Pinterest significantly influence the popularity of text-based clothing among young consumers. Viral slogans, influencer marketing, and online fashion communities rapidly spread new design trends across different countries and cultures. Consequently, youth fashion has become increasingly interconnected with digital communication and online self-presentation.

Text-based clothing also functions as a form of social communication and activism. Modern youth often use fashion to express opinions regarding environmental issues, equality, mental health awareness, and social justice. Clothing containing messages related to sustainability, feminism, freedom, and individuality reflects the growing social consciousness of younger generations. In this regard, fashion becomes a visual language through which individuals communicate social attitudes and ideological positions.

Consumer behavior studies demonstrate that textual designs strongly influence purchasing decisions among young people. Consumers are more likely to select clothing that reflects their

personal beliefs, emotions, and social identity. Therefore, text-based fashion products possess both symbolic and commercial value within the modern fashion market.

Typography and Visual Communication in Youth Fashion

Typography represents one of the central elements of text-based clothing design. The visual appearance of textual elements significantly affects the readability, aesthetic quality, and psychological impact of fashion products. Designers use various typographic styles to create emotional and visual effects suitable for different youth fashion trends.

Minimalist typography characterized by clean sans-serif fonts is widely used in modern streetwear and casual fashion. Bold typography, oversized letters, and asymmetrical compositions create dynamic visual impressions and attract attention. Handwritten typography and artistic calligraphic styles are often associated with individuality and creativity, particularly among artistic youth communities.

The placement of textual elements on clothing also influences visual communication. Front-centered slogans are typically designed to maximize visibility and direct communication, while large back prints are commonly associated with streetwear aesthetics. Sleeve typography, diagonal compositions, and layered graphic elements create more experimental and contemporary visual effects.

The effectiveness of typography depends on several design principles, including contrast, balance, harmony, rhythm, and readability. Proper integration of textual and graphic elements contributes to stronger emotional engagement and more effective communication between fashion products and consumers.

Modern Technologies and Sustainable Approaches

Technological advancements have significantly influenced the development of text-based youth fashion. Digital printing technologies, sublimation methods, embroidery techniques, and AI-assisted graphic design tools allow designers to create more innovative and visually complex textual compositions. Artificial intelligence technologies are increasingly used to generate slogans, typography concepts, and personalized fashion content.

At the same time, sustainable fashion has become an important aspect of modern apparel production. Young consumers demonstrate growing interest in environmentally responsible fashion products made from organic fabrics, recycled materials, and eco-friendly printing technologies. Sustainable textual messages promoting environmental awareness and ethical consumption are becoming increasingly common in contemporary youth clothing design.

As a result, modern text-based fashion combines aesthetic innovation, psychological influence, sociological significance, and technological development within a single design system.

Table 1. Psychological and Sociological Functions of Text-Based Design in Youth Clothing

Design Element	**Psychological Effect**	**Sociological Function**
Motivational slogans	Increases confidence and motivation	Promotes positive social values
Minimalist typography	Creates calmness and simplicity	Reflects modern youth identity
Bold graphic text	Attracts attention and emotional energy	Symbolizes individuality and rebellion

Design Element	Psychological Effect	Sociological Function
Streetwear inscriptions	Encourages self-expression	Represents youth subcultures
Eco-friendly textual messages	Develops environmental awareness	Supports sustainable social movements
Social activism slogans	Influences emotional perception	Communicates social and political opinions

Conclusion

In conclusion, text-based design in youth clothing has become an important cultural, psychological, and sociological element of contemporary fashion. For modern youth, clothing is no longer viewed only as a practical necessity; it has become a visible means of expressing personality, emotions, beliefs, and social position. Slogans, graphic inscriptions, and typographic compositions allow young people to communicate their inner world through visual language. The psychological significance of such designs is closely connected with emotional response, self-confidence, identity formation, and motivation.

The choice of words, font style, color, and composition can influence both the wearer's self-perception and the viewer's interpretation of the garment. In this sense, motivational, minimalist, and symbolically meaningful inscriptions are especially relevant for youth fashion, as they create a connection between personal identity and public expression.

From a sociological point of view, text-based clothing reflects youth culture, collective identity, and social belonging. Streetwear, digital communication, and social media have strengthened the role of fashion as a communicative tool, allowing young consumers to show cultural affiliation, personal values, and participation in different social movements or subcultures. At the same time, modern technologies and sustainable design approaches are opening new possibilities for the development of text-based apparel. Digital typography, advanced printing methods, design software, and environmentally responsible materials help create innovative and socially conscious fashion products.

Therefore, text-based youth fashion can be understood as an interdisciplinary field that combines fashion design, psychology, sociology, communication, and marketing. Overall, textual design in youth clothing is not only a decorative feature but also a meaningful form of communication that reflects the values, emotions, identities, and cultural interests of modern youth.

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CENTRAL ASIAN SECURITY ISSUES: TOP THREATS AND SOLUTIONS

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Abstract. *This article analyzes the main security issues in the Central Asian region. In particular, problems related to terrorism and religious extremism, drug trafficking, cross-border and water resources, geopolitical factors and cybersecurity threats are highlighted. Cooperation between the states of the region, security policy within the framework of the Shanghai Cooperation Organization and the Commonwealth of Independent States were also analyzed. The article provides scientifically based conclusions about the efforts of the countries of Central Asia to ensure regional stability and ways to eliminate security threats.*

Keywords*. Central Asia, security issues, terrorism, religious extremism, regional security, geopolitical factors, drug trafficking, transnational crime, water resources, border issues, cybersecurity, Afghan factor, SCO, CIS, regional cooperation, international security, Radicalization, strategic territory, political stability, global security.*

Introduction. Central Asia is one of the most geopolitically important regions of the world. This region includes Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan and Turkmenistan. The region is an important strategic region between Europe and Asia and is distinguished by its rich natural resources, convenient transport corridors and geopolitical location. In the era of globalization, security issues in Central Asia are of great importance not only for the states of the region, but also for the international community. Terrorism, religious extremism, drug trafficking, water resources, illegal migration and geopolitical competition are the main factors threatening the security of the region. Long-term instability in Afghanistan has a negative impact on the security of Central Asian countries. Therefore, the countries of the region pay great attention to strengthening cooperation in order to ensure security, working with international organizations and developing modern security systems.

Materials and Methods. This article is based on the analysis of scientific literature, official sources, and existing research on regional security issues in Central Asia. The study uses descriptive, comparative, and analytical methods to examine terrorism, religious extremism, drug trafficking, border problems, water resources, geopolitical factors, and cybersecurity threats.

1. Terrorism and religious extremism: one of the most important factors threatening the security of Central Asia are terrorism and religious extremism. In recent years, terrorist organizations operating in different parts of the world have tried to increase their influence in Central Asia.

In particular, groups such as ISIS, al-Qaeda and the Islamic Movement of Uzbekistan have tried to engage young people in radical ideas. Terrorist organizations mainly:

Political instability and armed conflict in Afghanistan increase the threat of terrorism. The approach of individual combat groups to the border areas is of concern to the countries of Central Asia.

2. Drug trafficking: Another major security problem in Central Asia is drug trafficking. Afghanistan is one of the largest drug producers in the world. Drugs produced in Afghanistan often transit through Central Asia to other countries. Funds raised from the drug trade also serve to fund some terrorist groups. This strengthens the relationship between drug trafficking and terrorism.

3. Problems with border and water resources: some border areas between the states of Central Asia are not yet fully delimited and demarcated. Conflicts periodically arise on the borders of Kyrgyzstan and Tajikistan.

The issue of water resources is also an important component of Central Asia's security. The main sources of water in the region are:

If high-current countries seek to use hydropower, low-current countries require more water for agriculture. This creates some controversy.

4. Geopolitical factors and influence of external forces: Central Asia is a conflict zone of interests of large states due to their wealth of natural resources and strategic location. In the region:

Competition between external forces can in some cases negatively affect the political balance in the region. Therefore, the countries of Central Asia are trying to pursue a multi-vector foreign policy.

5. Cybersecurity threats: With the development of information technology in the modern world, the issue of cybersecurity has also become an urgent problem.

The weakness of cybersecurity can cause serious damage to public administration, the banking system and strategic infrastructure.

6. Ways of regional cooperation and security: cooperation between states is important for ensuring security in Central Asia.

Results. The results of the study show that the Central Asian security system is formed under the influence of several interconnected threats. The main risk factors were disagreements and geopolitical competition on issues of terrorism and religious extremism, drug trafficking, border problems, water resources. In particular, the prolonged instability in Afghanistan complicates the situation in the region and creates conditions for the activation of radical groups. This leads to an increase in the level of danger in border areas. Transnational crime and corruption are on the rise as a result of drug transit through Central Asia. This process has a negative impact not only on state security, but also on social stability. The analysis showed that issues of water use and delimitation of borders also sometimes cause disagreements between the states of the region. These factors directly affect environmental and economic security. In general, the most important areas for ensuring security in Central Asia are the strengthening of regional cooperation, the development of joint security mechanisms, increasing economic stability and preventing radicalization among young people.

Discussion. There are different opinions in scientific and political circles on Central Asian security issues, sometimes contradicting each other. The security of the region is a complex system in which, along with internal factors, external geopolitical consequences also play an important role. The main threat is terrorism and religious extremism. " In their opinion, the spread of radical ideas is directly related to social problems, unemployment, low education and religious illiteracy. From this perspective, if economic and social conditions improve, the rate of radicalization will decrease. Another group believes that external factors have the greatest impact on safety. In particular, strategic competition between Russia, China and the United States affects the domestic politics of Central Asian countries. According to some analysts, this makes it difficult to strengthen security in the region. The issue of Afghanistan is also one of the most discussed topics. At first

glance, instability in Afghanistan remains the main source of terrorism, drug trafficking and illegal migration. On the other hand, if countries in the region strengthen cooperation, this will significantly reduce the risk. Water resources and border issues are also treated differently. Some experts argue that these problems can be solved through negotiations with historical and technical reasons. However, other analysts say future water shortages could be one of the biggest sources of conflict in Central Asia. There are also differing opinions about the drug trade. Some experts believe that this problem can be solved mainly by strengthening the law enforcement system. Others argue that this is not only a security but also a social and economic issue. There are also two main approaches to cybersecurity discussions: one says that it is enough to strengthen technological protection, and the other emphasizes the importance of improving information literacy and digital culture of citizens. In general, the discussions show that the security of Central Asia is due to more than one reason. It is formed as a result of the interaction of internal socio-economic conditions, regional politics and global geopolitical processes. Therefore, ensuring security requires an integrated approach based not only on the use of force, but also on diplomacy, economic development and education.

Conclusion. In general, the Central Asian security system is shaped by several interconnected threats. The main threats are terrorism and religious extremism, drug trafficking, water and border problems, and geopolitical competition. These factors have a direct impact on the political stability and economic development of the countries of the region.

1. In particular, the long-term instability in Afghanistan further complicates the security situation in the region, increases the risk of radical groups and illegal actions. At the same time, drug transit and transnational crime remain a serious threat to regional security.

2. some disagreements on the use of water resources and borders can also affect trust between states. This is even more important for regional cooperation.

3. Therefore, in order to ensure security, the states of Central Asia need to strengthen interaction, develop the exchange of information, strengthen borders and consistently continue policies aimed at preventing radicalization among young people. In general, the achievement of stability in the region can only be carried out by joint efforts and a joint strategy.

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ROLE OF WOMEN IN PREVENTING THREATS AGAINST OUR NATIONAL SPIRITUALITY

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Abstract. *The article focuses on the scientific and spiritual outlook of young people. Today, raising every young individual to be a well-rounded human being is a requirement of our time. Only a comprehensive developed individual, who can appreciate and adhere to national values and moral qualities, can build an independent future. Therefore, educating the younger generation based on national customs, values, moral virtues, and our national spirituality is of particular importance today.*

A unique heritage of our ancestors is the masterpiece "Qobusnoma" by Kaykovus, who lived in the 1020s, written in the form of a book of admonitions (counsel). "Qobusnoma" serves as an important source in developing qualities such as love for the Motherland, a passion for science and knowledge, affection for one's people, and always being supportive of others in the minds of the younger generation.

In today's globalized world, fierce competition, confrontations, and conflicts are intensifying on a global scale. Religious extremism, terrorism, drug addiction, human trafficking, "mass culture," and other similar threats are steadily increasing, undermining the national, religious, and family values and beliefs that humanity has practiced for centuries. The negative impacts of Western culture can be observed in the elements that have traditionally served to ensure the spiritual development of our people: art, literature, and clothing etiquette. Today, information attacks and threats on the global stage are ruthlessly instilled through various social networks, manipulating people's minds. It is an undeniable truth that such numerous threats cause serious problems in human life, especially in the upbringing of youth. This article explores the methods and approaches through which we can protect our youth from the clutches of this endless information influx.

Keywords*: custom, youth, clothing, etiquette, communication, orator, upbringing, morality, respect.*

INTRODUCTION

In educating the younger generation from childhood in the spirit of respect for national and universal values, as well as the masterpieces of culture, and in forming ideological immunity against certain manifestations of "mass culture" and various harmful ideas and information, the communication of women with youth and their oratorical culture hold a special significance. From this, it follows that, firstly, to minimize the negative consequences of globalization and the onslaught of malicious, biased information attacks under the guise of "mass culture," it is required to raise the political consciousness, as well as the legal, moral, and aesthetic culture of the population, particularly the youth.

However, we often limit ourselves only to textbooks and schools. If we look deeper into this, we encounter the question: what is the actual reality? Today's rapid progress in science and

technology renders yesterday's news obsolete. For this reason, our women must engage in continuous independent research, stay informed about daily updates, and teach young people to think critically by shaping their attitudes toward the subject matter.

2. LITERATURE REVIEW

At this point, it is beneficial to recall a highly valuable piece of advice from one of our mentors. They used to say: *"The secret of a human being is like the root of a tree. Leaves draw strength from the roots and sprout from a completely dry trunk. Leaves resemble the roots. Just as there are roots in a tree, the carnal self and the intellect are interrelated. For this reason, knowledge enters from three directions: through hearing with the ear, through reading with the eye, and through writing with the hand."* For our youth, acquiring knowledge through the eyes and ears seems easy, because in this case, knowledge is learned without excessive effort. Writing, however, requires considerable hardship and labor. Therefore, many young people avoid this task.

In addition to the aforementioned ideas on youth education found in the heritage left by our ancestors, respect for our national values, traditions, and customs is considered one of the key factors in increasing a person's love and affection for their Motherland. For instance, we can list works such as *"Siyosatnoma"* by Nizam al-Mulk, *"Saodatnoma"* by Nasir Khusraw, *"Qutadghu Bilig"* by Yusuf Khass Hajib, *"Divan Lughat al-Turk"* by Mahmud al-Kashgari, *"Gulistan"* by Saadi, and *"Hibat al-Haqa'iq"* by Yugnaki.

Taking the above points into consideration, a complete, well-formed, and standard-compliant speech culture is one of the most vital, integral, and so to speak, foundational components of our women's overall communicative culture. When conversing with youth, the quality of the voice, proper breathing during the speech process, clear pronunciation of sounds and sound combinations, and a number of other phenomena are taken into account. The primary issue in the conversation process is the voice. For any individual whose main tool is speech, the voice is of decisive importance.

The famous Russian scholar M.V. Lomonosov, in his *"Short Guide to Rhetoric,"* states that to be an orator, natural ability is first required, and natural ability is divided into mental and physical types. By physical ability, the scholar means a loud and pleasant voice, long breath, and a strong chest, as well as a healthy body and an elegant posture. Generally speaking, whether one is a politician, teacher, actor, or journalist, even if their oral speech possesses all communicative qualities, if any flaw is detected in their voice, such speech loses at least half of its impact. To avoid falling into the situation of the muezzin in Sheikh Saadi’s *"Gulistan"*, it is better for those whose primary tool of activity is not speech to pursue other professions.

It is no secret that among professions where speech is the main tool of activity, teaching ranks first; moreover, the number of teachers significantly exceeds the number of those engaged in other professions of this kind. Any flaw, whether large or small, in a teacher's live speech does not escape the notice of young people and immediately draws their attention. Historians have written that the famous ancient Greek orator Demosthenes initially could not deliver beautiful and impactful speeches because his voice was low, his pronunciation was poor, and his breath was short.

3. RESEARCH METHODOLOGY

The longer and more sustained the exhalation process is, the better it is for communication, as sound and speech are produced precisely during this exhalation phase. To illustrate, when individuals experience intense excitement, severe stress, or profound grief—and generic emotional shifts—they often lose control over their inhalation and exhalation phases while speaking.

The youth of the 21st century is characterized by their capacity for independent thought. Analyzing and reflecting upon events, phenomena, and externally received data is what forms this independent mindset. Concurrently, it is the fundamental duty of adults within the family structure to listen to their children's opinions, create opportunities for them to express their understandings, and guide them onto the right path. Frequently, due to adult indifference toward these responsibilities, several shortcomings emerge on the part of our women in countering threats directed against our national spirituality and in purging these hazards from the minds of the youth. To rectify these shortcomings, we must focus not only on public speaking (rhetoric) but also explicitly on the ethics of youth communication.

4. RESULTS AND DISCUSSION

The analysis shows that one of the main threats to youth spirituality is uncontrolled access to information through smartphones and social networks. Many parents are pleased that their children can use digital devices, but they often fail to monitor the content their children consume. As a result, age-inappropriate and harmful information may negatively influence young people’s worldview, morality, and national values. The study also shows that women, parents, and teachers play an important role in forming ideological immunity, communication culture, book-reading habits, and critical thinking among youth.

Communication is a vital prerequisite for human life and activity. It is precisely through communication that individuals gain the ability to act cooperatively to master nature and satisfy their individual needs. During the process of communication, specific images and models of human behavior are formed, which subsequently become internalized. A person's cognitive thinking, as well as their capacity to analyze and evaluate the world and their own self-image, is developed during communication. Evaluating this issue comprehensively, the Polish psychologist J. Mellibruda asserts: *"Communication is as vital to us in interpersonal relationships as air."* Given that communication is an exceedingly intricate process, it is difficult to provide a single, definitive definition. Consequently, the concept of communication is typically defined by emphasizing its specific aspects:

- A) Communication is a process of establishing and developing contact, which is necessitated by the requirement for collaborative activity.
- B) Communication is the mutual interaction of subjects through a system of signs.

Communication is a fundamental need for human beings as social, conscious entities and carriers of consciousness. We observe that the lifestyle of various higher animals and humans diverges into two dimensions: connections with nature and connections with living beings. The first type of connection is termed "activity" as a specific form of human engagement. The second type of connection is determined by the fact that the interacting parties are living beings exchanging information. There are various definitions of the concept of "communication." While communication is inherent to all living creatures, it reaches its most perfected forms at the human level, where it is consciously realized through speech. In communication, the following dimensions are distinguished: content, purpose, and means.

- The content of communication refers to the information transmitted from one living creature to another during inter-individual contact. The content of communication may include data regarding the internal motivational or emotional state of the living being. Such information is transmitted from person to person and serves as a tool for establishing interpersonal relationships.

- The purpose of communication is the driving reason for which this type of activity arises in humans. In animals, the purpose of communication may serve to prompt another living creature to perform a specific action, or to warn them against doing something. For example, a mother can alert her offspring to danger through her voice or movements; certain animals within a herd can warn others that vital signals have reached them.

In humans, the number of communication purposes expands exponentially. In addition to those listed above, they include acquiring and transmitting knowledge about the world, education and upbringing, coordinating various actions within human collaborative activities, and establishing or clarifying personal and professional mutual relationships.

Communication represents mutual interaction among people; when people engage in communication, along with asking questions, giving commands, making requests, or explaining something, they set a goal to influence others and make things clear to them.

The purpose of communication reflects people's need for collaborative activity. In this context, communication manifests as interpersonal interaction—that is, the sum total of connections and mutual influences that arise during people's joint activities. Whether they intend to or not, those around them expect behavior that aligns with a certain model.

When addressing some parents, they express joy upon seeing that their child can fluidly navigate a smartphone despite their young age. However, most of them do not know—or more accurately, do not monitor—what their children are engaged with on those phones. A child with a smartphone in hand can download and consume any information that sparks their curiosity. Consequently, age-inappropriate information is poisoning the minds of the youth.

For any society to conquer the highest peaks of progress, the younger generation must undeniably acquire knowledge across all domains. Educating the youth in the spirit of high spirituality and love for the Motherland is a collective duty. The family is the smallest unit of society. The younger generation receives its primary stage of spirituality from the family and parents. Parents bear ultimate responsibility for the child within the home. They must look after and monitor their child's health, attire, behavior, and spiritual upbringing. Through their care or lack thereof, parents will either gift society an individual who flourishes and elevates their nation, or—due to negligence and irresponsibility—someone who would sell their honor and faith for a trivial sum. To prevent this, parents must pay serious attention to fostering a culture of book reading.

Parents must help young people reflect on what they know, awaken their interest, and stimulate their cognitive faculties. Youth determine the baseline of their own knowledge, onto which new information can be appended. Knowledge becomes durable only if it is acquired within the context of what a person already knows and understands. If information is presented to a student without being linked to prior knowledge, it is quickly lost.

In the educational process as well, students must actively participate so they can consciously and thoroughly comprehend new information and approach it critically. The student becomes active by thinking on the basis of a designated objective and expressing their thoughts in their own words. The demonstration of knowledge occurs through active thinking via oral or written speech. In this manner, previously acquired knowledge is elevated to the level of conscious awareness. This then serves as the foundation for assimilating new knowledge. This process enables students to effectively bridge new information with prior knowledge because a contextual framework for comprehension has been established. When students monitor their own understanding, they compare new information with their existing perceptions, consciously linking

the new with the already known. They build bridges between old and new knowledge to create a new understanding (as illustrated in the conceptual framework below): Reflection (reasoning) is crucial for young people. In this phase, knowledge is consolidated, and a different (more complete) understanding of the issue under study is formed compared to previous phases, leading to an increase in "erudition." Such transformations can occur only when the student achieves their learning objective. Thus, this phase transitions the student from a lower level of erudition to a higher one. This is reflected in the student's ability to express new ideas and information in their own words. Ultimately, students retain best what resonates with them the most.

5. CONCLUSION

From the above reflections, it can be concluded that the role of grandparents, parents, and women in countering threats directed against our national spirituality and eliminating them from the minds of the youth fundamentally traces back to education and knowledge (*ilm*). Wherever knowledge exists, books multiply; wherever books exist, knowledge flourishes. Throughout history, the presence of books and the general attitude toward them within any given society have served as a primary metric for that society's commitment to intellectual development.

Beginning in the ninth century CE, Muslims regarded books as the ultimate form of wealth. When individuals wished to present someone with the most valuable gift possible, they would offer a book. Historically, when the Caliph of Baghdad consulted his ministers regarding a gift worthy of presentation to the public, they unanimously recommended dedicating a grand library. Once this library was gifted to the Muslim public, it was named *"Dar al-Hikma"* (House of Wisdom) and subsequently evolved into the world's first academy of sciences. Because the enthusiasm of Muslims for knowledge and their passion for books were rooted in faith (*iman*) and sincerity (*ikhlas*), their endeavors bore fruit rapidly, allowing them to systematically organize and present various branches of sciences to all of humanity.

In keeping pace with a rapidly developing society and era, fostering a culture of book reading holds a paramount position. The upbringing and education of our youth is not the responsibility of a single individual. If we act collectively, our children will mature into independent decision-makers who contribute meaningfully to the progress of the Motherland and its people. A proper upbringing is instilled in an individual alongside spirituality, through maternal nurture, parental role-modeling, and the timeless admonitions of our ancestors.

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COLLABORATIVE COMPETENCE AND ITS EFFECTIVE ASPECTS IN THE SOCIAL ACTIVITY OF WOMEN

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Abstract. *In this article, as the importance of the human factor in socio-pedagogical practice continues to grow, the scientific foundations of the factors that are acquiring an ever-greater significance in the professional activity of specialists are analyzed. In this process, the concept of "collaborative competence" occupies a central place. The competence likewise expresses a person's ability to communicate effectively in the social environment, to organize purposeful cooperation with a team, to find constructive solutions in problem situations, to defend one's opinion on the basis of evidence, and to approach the common result responsibly.*

Keywords: *competence, collaborative, enhancing scientific potential, protecting the rights and legal interests of women.*

1. Introduction

In a number of countries around the world, considerable scientific research is being conducted on developing the professional competence of staff who work with women, on raising their intellectual potential, and on shaping the responsibility, professional preparation and thinking of system staff in protecting families. Particular attention is being devoted to protecting the rights and legal interests of women, increasing their economic, social and political engagement, safeguarding their health, providing them with vocational training and employment, broadly involving them in entrepreneurship, providing social support to women in need, and ensuring gender equality.

2. Literature Review

The "National Programme for 2022–2026 on Increasing the Engagement of Women in All Spheres of the Country's Economic, Political and Social Life," approved by Decree No. PF-87 of the President of the Republic of Uzbekistan dated 7 March 2022, is directed at such pressing issues as further strengthening the system of social protection for women, reinforcing their health, creating the conditions necessary for the education and upbringing of girls, nurturing talented and knowledgeable girls and enhancing their scientific potential, improving the legal foundations for protecting the rights and legal interests of women, increasing women's socio-economic and political engagement, strengthening their role in society — in particular in public administration — and ensuring gender equality. The implementation of such broad, responsible and complex tasks falls, first and foremost, upon the women activists in the neighborhood communities (mahallas). Carrying out these tasks effectively and achieving positive results demands knowledge and personal example from women activists; for this reason, experienced candidates who set an example through their personal qualities and who are dedicated and devoted are appointed to this position.

3. Research Methodology

The methodological basis of the research is the scientific analysis of the models that shape and develop the concepts of collaborative competence among specialists who work with women, and the practical application of the most suitable of these models.

4. Analysis and Results

Cooperation in providing social assistance to women is understood as the joint efforts of various actors — such as women's cooperatives, non-governmental non-profit organizations, and state bodies — to expand women's opportunities through shared resources, knowledge and collective action. This approach focuses on overcoming historical and social barriers, expanding women's access to education, financial services and markets, and increasing their economic and social independence. By working together, women can create support networks, voice their opinions in decision-making, and build more inclusive and equitable socio-economic structures [1; p. 25].

Cooperation among specialists who work with women raises the quality of services by improving communication, reducing duplicated efforts, and ensuring comprehensively coordinated care. This cooperation is of great importance in fields such as healthcare and social work, and it requires transparency, respect for women's independence, and regular collective preparation in order to overcome difficulties such as information attacks and mistrust [2; p. 102]. The principal elements of effective cooperation are regular meetings, joint trainings and interprofessional education, the main goal being to strengthen the role of women in decision-making for the sake of attaining health and well-being.

Competence — derived from the Latin word "competo," meaning "I attain, I correspond, I am suitable" — denotes the set of specific knowledge, skills and abilities that a person has acquired. Competence is also a requirement placed upon a specialist's educational preparation that is necessary in order to carry out effective activity in a particular field [3; p. 67]. It is a predetermined social requirement at the disposal of the state, placed upon the educational (professional) preparation that a learner (worker) needs in order to perform effectively in a particular field.

Education oriented toward forming competencies is the capacity of individuals to apply, in practice, the knowledge, skills and abilities they have acquired in their personal, professional and social activities. Education based on a competence-based approach forms in individuals independence, an active civic position, initiative, the ability to make rational use of media resources and information-communication technologies in their activity, conscious choice of a profession and trade, healthy competition, and general cultural skills.

The concept of collaborative competence is regarded as an important category in modern socio-pedagogical theory and practice. It signifies a person's ability to establish effective communication within a team, to work collaboratively, and to coordinate their activity with others in order to achieve common goals. From a socio-pedagogical standpoint, this competence is one of the principal factors that determine the professional effectiveness of specialists, psychologists, social workers, and those who work with families [4; p. 52].

The socio-cultural space is distinguished by its diversity, variability and richness; it stimulates activists' interest in joint and creative activity and makes it possible to broaden opportunities in mutual relations and to move beyond institutional boundaries. In order for the socio-cultural space to contribute to providing the conditions for an individual's development, it is necessary to ensure the integration of socio-cultural activity resources: social, upbringing-related and educational. Analyzing the existing directions of socio-cultural activity, we note that most of

them presuppose participants' active interaction with other people and incorporate various forms of joint action. To support each participant's initiative and engagement, it is considered necessary to have a readiness for collective work and mechanisms of communication and constructive interaction.

An important aspect of socio-cultural practices is that they stimulate participants' social engagement. This means that they should be aimed at supporting cooperation, mutual aid, responsibility and social interaction. By participating in such practices, a person develops empathy, learns to work in a team, and gains experience in solving common problems. It must be noted, however, that merely participating in socio-cultural practices does not guarantee the formation of prosocial engagement. The key point is that practitioners must have the capacity to make sense of the experience they have gained. This means that participants must have the opportunity to reflect on their actions, to analyze their mistakes and achievements, and also to connect the acquired experience with professional or life goals. It is important to create socio-cultural practices that not only stimulate social behavior but also help participants to understand it in terms of the growth of the knowledge and skills necessary for cooperation. For example, within the framework of a theatrical performance, participants can study history and culture, develop communication skills, and learn to work in a team and to resolve conflict situations.

5. Conclusion and Recommendations

As the importance of the human factor in modern socio-pedagogical practice grows, the professional activity of specialists is increasingly required to be carried out on the basis of collective cooperation, mutual trust and shared thinking. In this process, the concept of "collaborative competence" occupies a central place. This competence expresses a person's ability to communicate effectively in the social environment, to organize purposeful cooperation with a team, to find constructive solutions in problem situations, to defend one's opinion on the basis of evidence, and to approach the common result responsibly.

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SOCIO-PHILOSOPHICAL AND PEDAGOGICAL INTERPRETATION OF THE CONCEPTS OF "HISTORICAL THINKING" AND "VIRTUAL MUSEUM"

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Abstract. *The concepts of "historical thinking" and "virtual museum" are increasingly used together in history teacher education, yet they are interpreted differently across philosophy, museology and pedagogy, which leads to their superficial use in research and teaching. The aim of this study was to analyse the socio-philosophical and pedagogical interpretations of the two concepts, to substantiate their interrelation and to propose working definitions for the preparation of pre-service history teachers. The study employed a qualitative conceptual analysis of foundational works in the philosophy of history and memory studies, the philosophy of culture and museology, history education and museum education, together with Uzbek regulatory documents and national dissertations. The interpretations were compared along five dimensions: ontological essence, epistemological basis, social function, pedagogical content and educational outcome. From a socio-philosophical perspective, historical thinking emerges as a way in which society makes sense of the past, critically controls collective memory and orients itself in the present, while the virtual museum emerges as a digital form of heritage and a new "site of memory" that carries the risks of decontextualisation and of the simulacrum. From a pedagogical perspective, historical thinking is a system of learnable skills based on sourcing, contextualisation and second-order concepts, and the virtual museum is an interactive learning environment that provides repeated and comparative access to digitised primary sources. The two concepts are complementary: historical thinking gives the virtual museum a goal and turns the exhibit into evidence, whereas the virtual museum provides historical thinking with material and an environment. Four pedagogical conditions for overcoming the risks of digital heritage are identified. The working definitions can inform the content of history teaching methods courses and the design of museum-based learning tasks.*

Keywords: *historical thinking; historical consciousness; virtual museum; collective memory; digital heritage; historical source; pre-service history teachers; museum education.*

Introduction

The way a society understands its past shapes its present values and its expectations of the future. Historical thinking is therefore not only an internal matter of the history curriculum but a phenomenon of social and philosophical significance (Rüsen, 2005). At the same time, digital technologies have created new forms of encounter with the past: museum collections are being digitised, and virtual museums have become a mass means of access to historical and cultural heritage (Parry, 2007; Schweibenz, 1998). The definition of the museum adopted by the International Council of Museums emphasises that museums research, collect, conserve, interpret and exhibit heritage and offer varied experiences for education and reflection (International Council of Museums [ICOM], 2022).

In Uzbekistan, the study of national history and cultural heritage, the digitalisation of museum activity and the use of museum resources in education are defined as priorities of state policy (Republic of Uzbekistan, 2022a, 2022b). The history teacher is the key actor who translates these priorities into classroom practice. Consequently, pre-service history teachers need a deep understanding of what historical thinking and the virtual museum are, and they need to be able to use them purposefully in teaching.

However, both concepts are interpreted differently across disciplines. In philosophy, historical thinking is discussed within the problems of historical consciousness and historical knowledge (Collingwood, 1946; Ricoeur, 2004), whereas in education it is treated as a set of skills of working with sources (Seixas & Morton, 2013; Wineburg, 2001). The virtual museum is regarded in museology as a form of presenting collections (Schweibenz, 1998), in the philosophy of culture as a digital mode of existence of cultural objects (Malraux, 1947; Benjamin, 1968) and in education as a learning environment (Hein, 1998). National studies have examined historical thinking as a basis for improving the professional competence of pre-service history teachers (Usmonaliyev, 2023) and virtual educational museums as a means of developing digital competences (Atamurodov, 2026), but they have not connected the two concepts at the socio-philosophical and pedagogical levels. This terminological fragmentation encourages a superficial, illustrative use of virtual museums in history teaching.

The **aim** of the present study is to analyse the socio-philosophical and pedagogical interpretations of the concepts of "historical thinking" and "virtual museum", to substantiate their interrelation and to propose working definitions for the preparation of pre-service history teachers. The study addresses three research questions: **RQ1** – How is historical thinking interpreted from socio-philosophical and pedagogical perspectives? **RQ2** – How is the virtual museum interpreted from these perspectives? **RQ3** – How are the two concepts interrelated, and which working definitions and pedagogical conditions follow from this for the preparation of pre-service history teachers?

Materials and Methods

Research design

The study used a qualitative conceptual (theoretical) design. Its methodological basis comprised systemic, hermeneutic, culturological, competence-based and activity-based approaches. The hermeneutic approach made it possible to interpret each concept within the tradition of thought in which it emerged, while the systemic approach made it possible to compare the interpretations and to identify the relations between them.

Materials

The corpus of analysis was formed purposively from four groups of sources. The first group included foundational works in the philosophy of history and memory studies (Collingwood, 1946; Nora, 1989; Ricoeur, 2004; Rüsen, 2005). The second group included works in the philosophy of culture and museology (Baudrillard, 1994; Benjamin, 1968; ICOM, 2022; Malraux, 1947; Parry, 2007; Schweibenz, 1998). The third group comprised research on history education (Lee, 2005; Lerner, 1982; Seixas, 2017; Seixas & Morton, 2013; Wineburg, 1991, 2001) and the fourth group research on museum education and learning (Falk & Dierking, 2013; Hein, 1998; Hooper-Greenhill, 2007; Vygotsky, 1978). Uzbek regulatory documents and national dissertations (Atamurodov, 2026; Usmonaliyev, 2023) were analysed to establish the national context. Sources

were selected according to three criteria: conceptual influence in their field, explicit treatment of at least one of the two concepts and relevance to teacher education.

Procedure of analysis

The analysis was carried out in three stages. At the first stage, the socio-philosophical interpretations of each concept were identified through comparative and critical reading of the philosophical sources. At the second stage, the pedagogical interpretations were systematised. At the third stage, the interpretations were compared along five analytical dimensions – ontological essence, epistemological basis, social function, pedagogical content and educational outcome – and logical-semantic analysis was used to formulate working definitions. The relations between the concepts were then modelled and the risks of using digital heritage in teaching were matched with pedagogical conditions for overcoming them.

Results

Socio-philosophical and pedagogical interpretation of historical thinking (RQ1)

From a socio-philosophical perspective, historical thinking manifests itself in three aspects. **First**, it is a way of making sense of the past. According to Collingwood (1946), the historian does not merely record an event but re-enacts the thought and intention behind it. Historical thinking is therefore linked with the effort to understand the worldview of people in the past, that is, with historical empathy.

Second, historical thinking regulates the relationship between memory and history. Collective memory is emotional, selective and prone to mythologisation, whereas history subjects it to critical examination on the basis of sources (Nora, 1989; Ricoeur, 2004). A person who thinks historically can value national memory while testing it against evidence. **Third**, historical thinking performs a function of social orientation: as Rüsen (2005) argues, the interpretation of past experience helps people to find their place in the present and to make decisions about the future. In this sense, historical thinking is a factor of social cohesion and of national self-awareness.

From a pedagogical perspective, historical thinking is regarded as a quality that does not develop spontaneously but is formed through deliberate instruction; Wineburg (2001) describes it as an "unnatural act". Experts read documents by sourcing, contextualising and corroborating them (Wineburg, 1991), and the structure of historical thinking is described through "second-order" concepts such as evidence, cause, change and perspective (Lee, 2005) or through the six concepts of historical significance, evidence, continuity and change, cause and consequence, historical perspective and the ethical dimension (Seixas & Morton, 2013; Seixas, 2017). Lerner (1982) showed that these skills develop through a system of problem-based tasks, and Vygotsky's (1978) zone of proximal development explains how they are formed with the gradually decreasing support of the teacher.

Synthesising the two perspectives, the following working definition is proposed: **historical thinking** is a person's ability to make sense of the past and to orient themselves in present social life by critically analysing historical sources, placing them in historical context, understanding the perspectives of people in the past and constructing evidence-based interpretations. For a pre-service history teacher, this ability is complemented by the capacity to develop the same kind of thinking in school students.

Socio-philosophical and pedagogical interpretation of the virtual museum (RQ2)

In the philosophy of culture, the virtual museum is evaluated through two opposing lines of thought. On the one hand, it realises Malraux's (1947) idea of the "imaginary museum" or

"museum without walls": exhibits from different countries are brought together in one space, which makes comparison possible and opens equal access to cultural heritage. This extends the social function of the museum and makes it a more democratic and inclusive space (ICOM, 2022). On the other hand, the digital copy loses the "aura" of the original, that is, its unique existence in time and space (Benjamin, 1968). If the copy is detached from its historical context, it may become a simulacrum – an image that no longer refers to a real past but reproduces itself (Baudrillard, 1994). From Nora's (1989) perspective, the virtual museum can be seen as a new "site of memory" of the digital age that preserves collective memory and transmits it to new generations.

From a pedagogical perspective, the virtual museum is not merely the online image of a collection (Schweibenz, 1998) but an environment of interactive communication with digital heritage (Parry, 2007). According to the idea of the constructivist museum, the visitor does not receive knowledge in a ready-made form but constructs it while working with exhibits (Hein, 1998). The museum experience is shaped by personal, socio-cultural and physical contexts (Falk & Dierking, 2013), and the main task of museum pedagogy is to support meaning-making (Hooper-Greenhill, 2007).

On this basis, the following working definition is proposed: a **virtual museum** is a digital educational and cultural environment that includes scholarly described digital copies of historical and cultural heritage objects, their metadata and interactive tools, and that enables the user to work with primary sources independently, repeatedly and comparatively. For a pre-service history teacher, the virtual museum is both an object of study and a tool for designing future lessons. The interpretations of both concepts are summarised in Table 1.

Table 1. *Comparative interpretation of the concepts of "historical thinking" and "virtual museum"*

Dimension	Historical thinking	Virtual museum
Ontological essence	A way of making sense of the past and relating to it	A form of existence of cultural heritage in digital space
Epistemological basis	Source analysis, contextualisation, re-enactment of past thought	Knowledge through the digital copy of an exhibit and its metadata
Social function	Critical control of memory, social orientation, national self-awareness	Preservation of collective memory, equal access to heritage
Pedagogical content	A system of skills formed through deliberate instruction	An interactive learning environment for working with primary sources
Educational outcome	Independent, evidence-based historical interpretation	Experience of independent, repeated and comparative work with sources

Note. Developed by the author on the basis of Collingwood (1946), Rüsen (2005), Nora (1989), Malraux (1947), Benjamin (1968), Wineburg (2001), Seixas and Morton (2013) and Hein (1998).

Interrelation of the concepts and pedagogical conditions (RQ3)

The analysis shows that historical thinking and the virtual museum are complementary concepts (Figure 1). Historical thinking gives the virtual museum a goal and meaning: the exhibit

ceases to be an object of viewing and becomes historical evidence. The virtual museum, in turn, provides historical thinking with material and an environment: access to primary sources, the possibility to enlarge, compare and revisit them, and metadata that serve as an evidence base. Both concepts converge in the figure of the pre-service history teacher, who first analyses exhibits as sources and then designs museum-based lessons for school students.

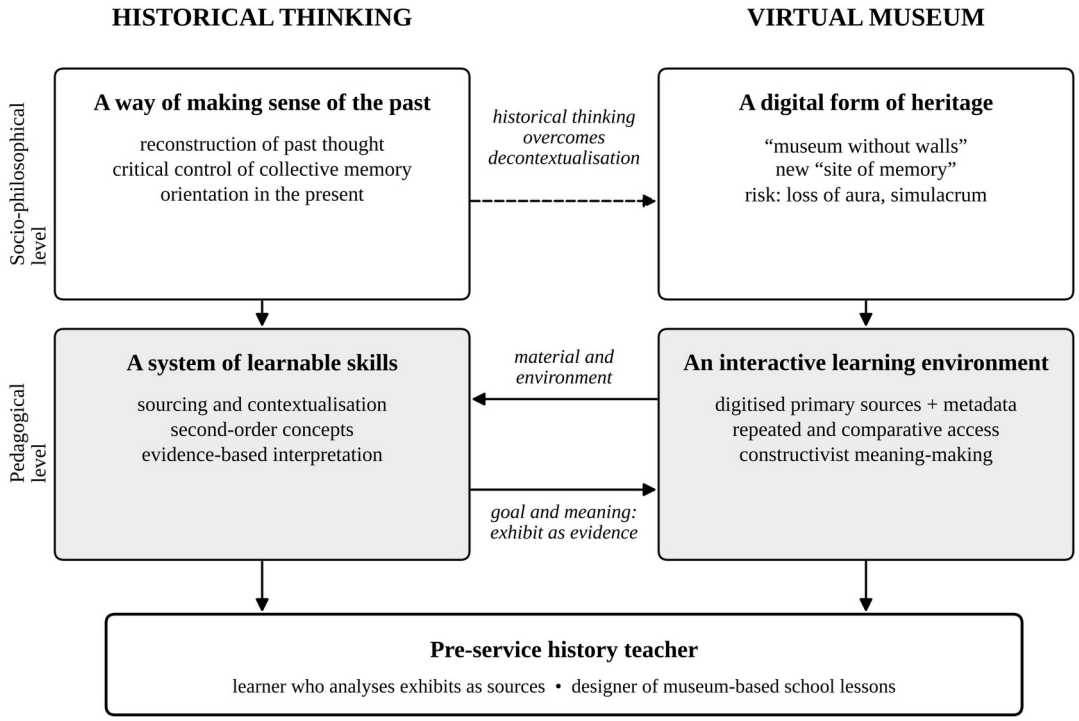


Figure 1. *Interrelation of the concepts of "historical thinking" and "virtual museum" at the socio-philosophical and pedagogical levels*

Note. Solid arrows show relations at the pedagogical level; the dashed arrow shows that historical thinking counteracts the decontextualisation of digital heritage. Developed by the author.

At the same time, the risks identified by the socio-philosophical analysis can be overcome only pedagogically, through historical thinking itself. Matching these risks with the pedagogical interpretation of both concepts made it possible to formulate four pedagogical conditions (Table 2).

Table 2. *Risks of using virtual museums and pedagogical conditions for overcoming them*

Risk	Manifestation in teaching	Pedagogical condition
Decontextualisation	The exhibit is shown as an isolated image without its period, place and purpose	Every exhibit is analysed in its historical context with the help of its metadata
Simulacrum and loss of aura	The digital copy is perceived as the past itself	Students discuss the original, the quality of digitisation and what the copy cannot show
Passive viewing	The virtual tour replaces analysis	Work with the exhibit is organised around a historical question and a hypothesis

Risk	Manifestation in teaching	Pedagogical condition
Uncritical trust in the platform	Descriptions and attributions are accepted without verification	Students evaluate the reliability of the platform and corroborate it with other sources

Note. Developed by the author on the basis of Benjamin (1968), Baudrillard (1994), Wineburg (1991) and Hein (1998).

Discussion

With respect to RQ1, the findings are consistent with Rüsen's (2005) and Seixas's (2017) view that historical consciousness and historical thinking are connected: what philosophy describes as "making sense of the past" is formed in education through specific, teachable skills. The proposed working definition integrates both levels, so that the social function of historical thinking – the critical control of collective memory – becomes an explicit educational goal rather than an implicit by-product of history lessons.

With respect to RQ2, the study reinterprets the problem of the digital copy raised by Benjamin (1968) and Baudrillard (1994) as a pedagogical task. The loss of the aura, which appears to be a weakness of the virtual museum, becomes an opportunity to raise critical questions about the original, the quality of digitisation and the reliability of the platform. This extends Hein's (1998) constructivist view of museum learning: meaning-making in a virtual museum requires not only activity but also source-critical activity.

With respect to RQ3, the study differs from national research in that it connects the two concepts within one system. Usmonaliyev (2023) treated historical thinking as a means of professional competence, and Atamurodov (2026) regarded virtual educational museums as a means of developing digital competences. In the present study, the virtual museum is defined as an environment for developing historical thinking, and historical thinking as the goal of using the virtual museum. For teacher education, this implies that courses in history teaching methods should combine source analysis of museum exhibits with the design of museum-based tasks for school students.

Several limitations should be acknowledged. The study is theoretical, and the corpus was formed purposively rather than through a systematic review, so other traditions – for example, post-colonial critiques of museum collections – were not considered. The proposed working definitions and pedagogical conditions have not yet been tested empirically. Future research should operationalise the definitions into assessment criteria and examine their effectiveness in the preparation of pre-service history teachers.

Conclusion

This paper has analysed the socio-philosophical and pedagogical interpretations of the concepts of "historical thinking" and "virtual museum". First, from a socio-philosophical perspective, historical thinking is a way of making sense of the past, of critically regulating the relationship between memory and history and of orienting oneself in society; from a pedagogical perspective, it is a system of skills of source analysis, contextualisation and evidence-based interpretation that is formed through deliberate instruction. Second, the virtual museum is, socio-philosophically, a digital form of heritage and a new "site of memory" and, pedagogically, an interactive learning environment for independent, repeated and comparative work with primary

sources. Third, the two concepts are complementary: historical thinking gives the virtual museum a goal and meaning, while the virtual museum provides historical thinking with material and an environment; the risks of decontextualisation and of the simulacrum are overcome through historical thinking. Working definitions of both concepts and four pedagogical conditions were proposed for the preparation of pre-service history teachers. The results can be used in teaching history teaching methods and museum studies courses and in designing museum-based learning tasks.

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MECHANISMS OF CORPORATE PREPARATION OF PRE-SERVICE TEACHERS FOR EDUCATIONAL (UPBRINGING) ACTIVITY BASED ON A SYNERGETIC APPROACH

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Abstract. *Contemporary schools expect teachers to organise educational (upbringing) work not in isolation but together with colleagues, families and social partners, yet initial teacher education still tends to prepare students for this work through linear, transmission-oriented courses. The aim of this study was to substantiate and empirically test an integral mechanism of corporate preparation of pre-service teachers for educational activity grounded in the synergetic approach. Theoretically, the study integrates the synergetic theory of self-organisation, the concepts of the learning organisation and professional capital, and the cultural-historical theory of interiorisation. The integral mechanism combines three groups of sub-mechanisms: synergetic (self-organisation, resonant non-linear guidance, bifurcation–attractor), corporate (corporate integration, cooperative collaboration, cluster partnership and the national ustoz–shogird mentoring tradition) and pedagogical-psychological (motivation, reflection, identification and interiorisation). It operates through an input–process–output–feedback algorithm embedded in a four-block model (target, content, technological and diagnostic blocks). A quasi-experimental pre-test–post-test design with a control group was conducted in 2023–2026 at three higher education institutions of Uzbekistan with 307 pre-service teachers (experimental group n = 156; control group n = 151). Readiness was assessed against procedural-functional, regulative-activity and emotional-evaluative criteria. At baseline, the groups did not differ ($\chi^2(2) = 0.04$, $p = .98$). After the formative stage, the share of students at the high level of readiness rose to 37.2% in the experimental group compared with 20.5% in the control group; the difference in mean readiness scores was statistically significant (Welch's $t(303.5) = 4.22$, $p < .001$) with a medium effect size ($d = 0.48$). The findings indicate that combining self-organisation with institutionalised university–school collaboration is an effective route to sustainable readiness for educational activity. The model can be applied in bachelor's programmes, in-service teacher training and regional pedagogical clusters.*

Keywords: *synergetic approach; corporate preparation; pre-service teachers; educational activity; self-organisation; professional learning community; mentoring; pedagogical cluster; teacher education.*

Introduction

The quality of teachers is consistently identified as the most influential school-level factor in educational outcomes, and advanced education systems increasingly prepare teachers not only as subject specialists but also as educators of character and as members of professional

communities (OECD, 2019; Darling-Hammond, 2006). The recommendations of the United Nations Secretary-General's High-Level Panel on the Teaching Profession call on states to strengthen initial teacher preparation, professional collaboration and the status of teachers (United Nations, 2024). In Uzbekistan, this agenda is reflected in the Law "On Education" (2020), the "Uzbekistan–2030" Strategy (2023), with its emphasis on human capital, and the Law "On the Status of the Pedagogue" (2024), which consolidates the teacher's role as an educator (*tarbiyachi*). These documents raise a practical question for universities: through which mechanisms can pre-service teachers become genuinely ready to organise educational work together with colleagues, schools, families and communities?

Educational (upbringing) activity is distinguished by its multidimensional character, by the impossibility of planning it fully in advance and by the non-linear nature of personal development. Research on character education demonstrates that well-designed, school-wide programmes produce substantial gains in students' social, emotional and moral development (Durlak et al., 2011; Lickona, 1991). Such programmes, however, are collective by nature: they depend on coordinated action by teams of teachers rather than on isolated individuals (Hargreaves & Fullan, 2012; Hargreaves & O'Connor, 2018). At the same time, initial teacher education often retains a linear, strictly regulated logic in which preparation for educational work is delivered as a set of courses disconnected from school practice (Zeichner, 2010; Korthagen, 2004). This creates a contradiction between the open, unpredictable nature of educational activity and the closed, directive format in which future teachers are prepared for it.

National studies have described the pedagogical conditions of preparing future teachers for educational activity and the technologies of their professional formation (Muslimov, 2013; Voxidova, 2022). Nevertheless, three gaps remain. First, preparation for educational activity has not been designed as an open, self-organising system. Second, the potential of corporate collaboration between the university, general secondary schools and social partners is used episodically rather than systematically. Third, the internal mechanisms that transform external pedagogical influence into the future teacher's own readiness, together with valid criteria for measuring this readiness, remain insufficiently elaborated.

The synergetic approach, which views complex systems as open, non-linear and capable of self-organisation (Haken, 1983; Prigogine & Stengers, 1984; Knyazeva & Kurdyumov, 2005), offers a methodological basis for closing these gaps. The **aim** of the present study is therefore to substantiate and empirically verify an integral mechanism of corporate preparation of pre-service teachers for educational activity based on the synergetic approach. The study is guided by three research questions: **RQ1** – What theoretical foundations justify a synergetic-corporate interpretation of preparation for educational activity? **RQ2** – Which mechanisms, and in what configuration, constitute an integral mechanism of such preparation? **RQ3** – Does the implementation of the integral mechanism significantly improve pre-service teachers' readiness for educational activity compared with traditional preparation?

Materials and Methods

Theoretical framework

The term "synergetics" derives from the Greek *synergetikos* – "acting together". Haken (1983) defined it as an interdisciplinary field studying how ordered structures arise spontaneously in open, non-equilibrium systems through the coordinated interaction of their parts. Prigogine and Stengers (1984) showed that such systems pass through points of instability (bifurcations) at which small influences may determine the direction of further development, giving rise to "order out of

chaos". Knyazeva and Kurdyumov (2005) transferred these ideas to the humanities, emphasising that effective guidance of a complex system must be "resonant" with its own internal tendencies. In education, the same line of thought is represented by complexity theory, which interprets classrooms and learning communities as emergent, self-organising systems whose collective capacity exceeds the sum of individual contributions (Davis & Sumara, 2006; Mason, 2008).

The term "corporate" (Latin *corporatio* – association, union) denotes joint activity bound by common goals, values and responsibility. Senge (2006) described the learning organisation as a system that develops through the shared learning of its members, and Schein (2010) defined organisational culture as a set of shared values, beliefs and behavioural norms. Hargreaves and Fullan (2012) introduced the notion of professional capital, arguing that teachers' effectiveness depends decisively on social capital, that is, on the quality of their collaboration. Research on professional learning communities (Vescio et al., 2008), lesson study (Lewis et al., 2006) and mentoring of beginning teachers (Hobson et al., 2009) confirms that collective forms of professional learning improve practice when they are sustained and embedded in schools.

The psychological level of the framework draws on cultural-historical and activity theories, according to which higher mental functions and moral qualities first appear in joint, socially shared activity and only later become the individual's internal property (Vygotsky, 1978; Leontiev, 1978). Self-determination theory identifies autonomy, competence and relatedness as conditions for internalised motivation (Ryan & Deci, 2000), while the concept of the reflective practitioner (Schön, 1983) and research on professional identity (Beijaard et al., 2004) highlight reflection and identification as drivers of professional growth.

On this basis, **corporate preparation of pre-service teachers for educational activity based on a synergetic approach** is defined in this study as a continuous, systemic and purposeful process of forming the professional, moral and communicative qualities of future teachers in an open, interaction-based educational environment through collective collaboration, shared values and the mechanisms of self-organisation and self-development. A **pedagogical mechanism** is understood as a system that sets in motion, in a definite order, the internal driving forces, means and conditions of a process in order to achieve a pedagogical goal. Unlike a condition (the necessary environment), a means (a specific tool) or a factor (an acting force), a mechanism integrates all three into a single driving structure. Table 1 contrasts the traditional and the synergetic-corporate logic of preparation.

Table 1. *Comparison of traditional and synergetic-corporate preparation of pre-service teachers for educational activity*

Criterion	Traditional preparation	Synergetic-corporate preparation
Nature of the system	Closed, linear, governed by external influence	Open, non-linear, self-organising
Main goal	Acquisition of ready-made knowledge and skills	Corporate readiness and capacity for self-development
Mode of guidance	Strict external control, directive management	Resonant, non-linear guidance; support of self-regulation
Teacher–student relationship	Subject–object, one-way influence	Subject–subject, multilateral cooperation
Form of collaboration	Individual, isolated activity	Corporate team, professional community, partnership

Criterion	Traditional preparation	Synergetic-corporate preparation
Source of development	External instructions	Internal need, bifurcation points, creative fluctuations
Expected result	Standardised, planned preparation	Emergent, qualitatively new educational competence

Note. Compiled by the authors on the basis of Haken (1983), Knyazeva and Kurdyumov (2005) and Hargreaves and Fullan (2012).

Research design and participants

A quasi-experimental pre-test–post-test design with a control group was employed. The study was carried out in 2023–2026 in three stages: the ascertaining stage (2023–2024), at which the current state of preparation was diagnosed and the scientific apparatus was clarified; the formative stage (2024–2025), at which the integral mechanism and the model were implemented in the experimental group; and the analytical-generalising stage (2025–2026), at which the data were processed and compared. The sample comprised 307 bachelor's students in teacher education programmes at three institutions (Table 2). Allocation to groups was made at the level of intact academic groups; 156 students formed the experimental group (EG) and 151 the control group (CG).

Table 2. *Distribution of participants by institution and group*

Higher education institution	EG	CG	Total
Samarkand State Pedagogical Institute	54	49	103
Andijan State Pedagogical Institute	56	51	107
Kokand State University	50	47	97
Total	**156**	**151**	**307**

Note. EG = experimental group; CG = control group.

Intervention

In the EG, preparation was organised on the basis of the integral mechanism and the four-block model described in the Results section. It included collective forms (seminar-trainings, team projects, lesson study), mass forms (educational events, social campaigns, spiritual and educational meetings) and individual forms (pedagogical practice in partner schools, independent work, reflective tasks). Interactive methods – problem-based and project-based learning, collaborative learning, case study, brainstorming, role and business games – were selected because each activates several sub-mechanisms simultaneously. Practice was organised under cluster agreements with general secondary schools and accompanied by mentoring in the *ustoz–shogird* (master–apprentice) format. The didactic support of the course "Trends in Continuous Education" was revised accordingly. The CG followed the standard curriculum without these elements.

Criteria, instruments and data analysis

Readiness for educational activity was assessed against three criteria. The **procedural-functional** criterion reflects the ability to plan, design, organise and analyse educational activity and to choose methods appropriate to the situation. The **regulative-activity** criterion reflects the ability to manage, monitor and correct one's activity, to make independent decisions in pedagogical situations and to reflect on its results. The **emotional-evaluative** criterion reflects a value-based emotional attitude to educational work, empathy, subject–subject relationships with

pupils and objective evaluation of oneself and others. Data were collected through pedagogical observation, questionnaires, interviews, diagnostic tasks, expert evaluation of activity products and analysis of students' portfolios. Each criterion was rated on a three-level scale: 3 – high (initiative), 2 – medium (adaptability), 1 – low (standard activity).

Group distributions were compared with Pearson's χ^2 test of independence. Mean readiness scores were compared with Welch's two-sample t-test (Student's t criterion with the Welch–Satterthwaite correction of degrees of freedom), and effect size was estimated as Cohen's d (Cohen, 1988). The significance level was set at $\alpha = .05$.

Results

The integral mechanism of corporate preparation (RQ1, RQ2)

Theoretical analysis made it possible to distinguish three groups of mechanisms which together form an integral mechanism of corporate preparation (Figure 1).

Synergetic mechanisms constitute the internal driving force of the process. The *self-organisation* mechanism is its core: readiness is not "poured in" from outside but formed through the student's own search, choice and creative activity; it is launched through problem-based tasks, freedom of choice and the independent design of educational events. The *resonant non-linear guidance* mechanism rests on the principle that a small but timely and well-directed influence can yield a large developmental effect; it is realised through facilitation, tutoring and timely advice rather than ready-made answers. The *bifurcation–attractor* mechanism is linked to critical moments of professional development – the first independent lesson, a difficult educational situation, a professional choice – and to value attractors such as the image of an ideal educator.

Corporate mechanisms secure the collective nature of preparation. *Corporate integration* unites the university, general secondary schools and social partners around a common goal through cooperation agreements and joint projects: the university provides theoretical knowledge, the school provides the practical environment and experienced teachers provide mentoring. *Cooperative collaboration* produces a synergetic effect in which joint action exceeds the sum of individual efforts; it is realised through team projects in which roles (idea author, organiser, presenter) are distributed, through lesson study and through peer learning. The *cluster* mechanism integrates teacher education institutions, schools, regional centres of pedagogical excellence and partners into a single educational ecosystem. The *ustoz–shogird* mechanism, rooted in the national pedagogical heritage, transmits educational mastery and moral values through the mentor's personal example and daily cooperation.

Pedagogical-psychological mechanisms secure the internal transformation of the personality. The *motivational* mechanism develops stable intrinsic interest through success situations and the linking of personal and professional goals. The *reflective* mechanism provides self-analysis and self-correction through reflective tasks ("What went well?", "What would I do differently?", "What have I learned?"), portfolios and pedagogical diaries. The *identification* mechanism operates through the positive example of a mentor and a sense of belonging to the professional community. The *interiorisation* mechanism converts values experienced in joint activity – cooperation, responsibility, mutual respect – into personal convictions.

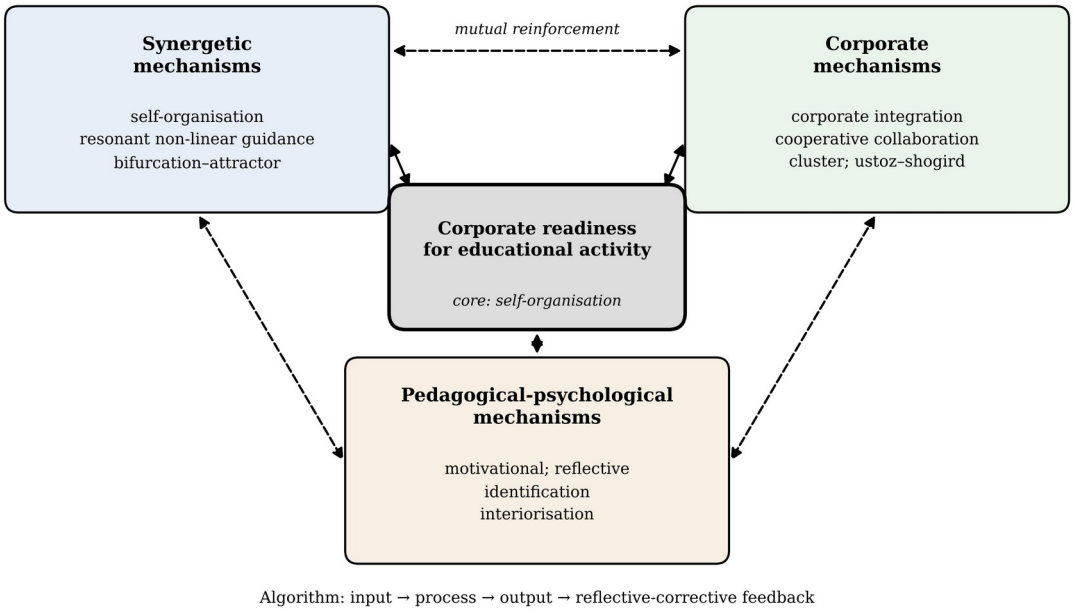


Figure 1. *Structure of the integral mechanism of corporate preparation of pre-service teachers for educational activity*

Note. Solid arrows show the contribution of each group of mechanisms to readiness; dashed arrows show mutually reinforcing relations between groups. Developed by the authors.

The groups do not function separately. Corporate collaboration strengthens motivation and identification; reflection secures synergetic self-regulation; motivation becomes the driving force of self-organisation. This interaction produces an emergent effect consistent with the synergetic principle that the whole is qualitatively superior to the sum of its parts. Balance among the groups is essential: if synergetic mechanisms dominate while corporate ones are weak, preparation becomes excessively individualised; conversely, the absolute dominance of corporate mechanisms restricts individual development.

The integral mechanism operates according to an input–process–output–feedback algorithm, with different sub-mechanisms leading at each stage (Table 3). The reflective-corrective feedback loop returns evaluated outcomes to the input stage, turning the process into a self-correcting, spirally developing system.

Table 3. *Stages of the integral mechanism, leading sub-mechanisms and expected results*

Stage	Leading mechanisms	Means of activation	Expected result
Input (diagnostic)	Motivational; identification	Success situations; mentor's example; diagnostics	Motivation; identified baseline
Process (core)	Self-organisation; corporate integration; cooperative collaboration; resonant guidance	Problem-based tasks; cluster projects; lesson study; facilitation	Knowledge, skills and values for collective educational work
Output (resultant)	Interiorisation	Joint educational practice in partner schools	Emergence of corporate readiness

Stage	Leading mechanisms	Means of activation	Expected result
Feedback (corrective)	Reflective; bifurcation–attractor	Reflective diary; portfolio; analysis of critical situations	Self-correction and further development

Note. Developed by the authors.

The algorithm is embedded in a four-block model. The **target block** contains the social demand, the goal, five approaches (synergetic, systemic, corporate, activity-based and cluster) and eight principles (synergetic openness and self-organisation, corporativeness, axiological orientation, dialogicity, individualisation and differentiation, practical orientation, reflexivity, integrativity). The **content block** comprises five successive stages: motivational-value, cognitive, activity-practical, collective-corporate and reflective-evaluative. The **technological block** includes forms (corporate training, *ustoz–shogird* system, project seminars, educational practicum), methods (problem-project learning, collaborative learning, case study, role and business games) and means (digital platforms, corporate portfolio, multimedia projects). The **diagnostic block** contains the criteria, indicators and levels of readiness. The model functions under five pedagogical conditions: an open, trust-based learning environment; organised corporate collaboration and a professional community; synergetic-reflective guidance; a close link between preparation, school practice and the cluster; and stimulation of motivation and value attitudes.

Experimental results (RQ3)

At the ascertaining stage, the distributions of the EG and the CG were practically identical for every criterion ($\chi^2(2) \leq 0.08$, $p \geq .96$), and the low level prevailed in both groups (42–43%). After the formative stage, the EG shifted markedly towards the medium and high levels, whereas the CG remained almost unchanged (Table 4).

Table 4. *Distribution of pre-service teachers by readiness levels for each criterion before and after the experiment (%)*

Criterion	Group	Before			After			$\chi^2(2)$ after
		High	Medium	Low	High	Medium	Low	
Procedural-functional	EG	22.4	34.6	43.0	34.6	42.9	22.4	13.61**
	CG	21.9	35.1	43.0	23.2	35.1	41.7	
Regulative-activity	EG	21.8	35.9	42.3	35.9	42.3	21.8	17.38***
	CG	21.2	35.8	43.0	21.2	35.8	43.0	
Emotional-evaluative	EG	19.9	37.2	42.9	37.2	42.9	19.9	18.87***
	CG	21.2	36.4	42.4	21.9	36.4	41.7	

Note. EG n = 156; CG n = 151. ** p < .01; *** p < .001. Before the experiment, differences between the groups were non-significant for all criteria.

Compared with the CG, at the end of the experiment the share of high-level students in the EG was higher by 11.4 percentage points for the procedural-functional criterion, by 14.7 points for the regulative-activity criterion and by 15.3 points for the emotional-evaluative criterion, while the share of low-level students was lower by 19.3, 21.3 and 21.9 points respectively. Mean scores on

the three criteria in the EG (2.12, 2.14 and 2.17) exceeded those in the CG (1.81, 1.78 and 1.80; Welch's t = 3.51–4.30, all p < .001).

Integral monitoring of readiness confirmed these results (Table 5, Figure 2). At baseline the group means were practically equal (t(304.8) = 0.17, p = .87). At the end of the experiment the EG mean was 2.21 (73.7% of the maximum score) versus 1.87 (62.3%) in the CG. The difference was statistically significant (t(303.5) = 4.22, p < .001) and exceeded the critical value $t_{0\cdot975} = 1.97$. The distributions also differed significantly ($\chi^2(2) = 17.12$, p < .001). The effect size (d = 0.48) corresponds to a medium effect (Cohen, 1988), and the ratio of EG to CG mean scores was 1.18.

Table 5. *Integral readiness for educational activity before and after the experiment*

Group	Stage	High, n (%)	Medium, n (%)	Low, n (%)	M (SD)	Test
EG	Before	26 (16.7)	71 (45.5)	59 (37.8)	1.79 (0.71)	t = 0.17, p = .87
CG	Before	24 (15.9)	69 (45.7)	58 (38.4)	1.77 (0.70)	χ^2 = 0.04, p = .98
EG	After	58 (37.2)	73 (46.8)	25 (16.0)	2.21 (0.70)	t = 4.22, p < .001
CG	After	31 (20.5)	69 (45.7)	51 (33.8)	1.87 (0.73)	d = 0.48; χ^2 = 17.12

Note. M = mean score on the 1–3 scale; t = Welch's t-test; d = Cohen's d; χ^2 with 2 degrees of freedom.

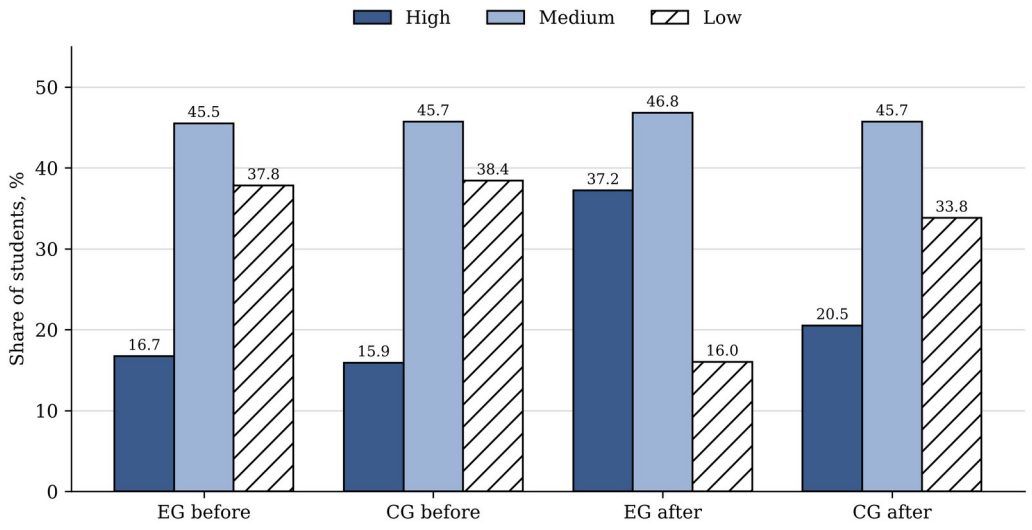


Figure 2. *Distribution of pre-service teachers by levels of integral readiness before and after the experiment (%)*

Note. Calculated by the authors from experimental data (EG n = 156; CG n = 151).

Discussion

The study answers the three research questions as follows. With respect to RQ1, the results support the interpretation of readiness for educational activity as an emergent property of an open system rather than the sum of separately acquired knowledge and skills. This is consistent with complexity-based accounts of education (Davis & Sumara, 2006; Mason, 2008) and extends them to the specific domain of preparation for upbringing work. With respect to RQ2, the study proposes an integral mechanism in which synergetic, corporate and pedagogical-psychological mechanisms

are united around a core of self-organisation. This addresses a gap in the literature: models of collaborative professionalism (Hargreaves & O'Connor, 2018; Vescio et al., 2008) explain *where* teachers learn together, while activity and self-determination theories (Vygotsky, 1978; Ryan & Deci, 2000) explain *how* collective experience becomes personal conviction; the integral mechanism connects these two levels in one operational structure.

With respect to RQ3, the experimental data show a significant advantage of the EG on all three criteria. The largest gain was observed for the emotional-evaluative criterion, which is consistent with the assumption that identification and interiorisation, activated through mentoring and joint practice in partner schools, primarily affect the value-based attitude to educational work. The magnitude of the effect is comparable with international evidence: meta-analyses report effects of a similar order for well-implemented, collectively organised social and emotional learning programmes (Durlak et al., 2011), and reviews of professional learning communities show that sustained collaboration changes practice when it focuses on concrete problems of teaching and learning (Vescio et al., 2008; Opfer & Pedder, 2011). The present results extend these conclusions to the pre-service stage and suggest that integrating the national *ustoz–shogird* tradition with contemporary mentoring (Hobson et al., 2009) and lesson study (Lewis et al., 2006) provides a culturally congruent route for transferring international experience into the educational practice of Uzbekistan.

The results also have practical implications. For higher education institutions, they support embedding cluster agreements with partner schools and structured mentoring throughout the whole period of study, from the first year to graduation, rather than confining them to episodic practicum placements (Zeichner, 2010). In the first and second years, motivational and cognitive mechanisms should lead; in the third year, corporate and practical mechanisms; in the fourth year, reflective and interiorisation mechanisms. For teacher educators, the mechanism offers a shared language for designing tasks that trigger self-organisation, cooperation and reflection. For policymakers, the model is aligned with the Law "On the Status of the Pedagogue" and the "Uzbekistan–2030" Strategy and can be scaled through regional centres of pedagogical excellence. A further prerequisite is the professional development of university staff, since only educators who themselves demonstrate openness, collaboration and self-development can activate the mechanism fully.

Several limitations should be acknowledged. The quasi-experimental design did not allow random assignment of individuals, and allocation was made at the level of academic groups, so clustering effects cannot be excluded. The three-level ordinal scale limits measurement sensitivity; future research should employ multi-item validated instruments and multilevel models that account for nesting by institution. The study covered three institutions in Uzbekistan, and the durability of the effect after graduation was not examined.

Conclusion

This paper has substantiated and empirically tested an integral mechanism of corporate preparation of pre-service teachers for educational (upbringing) activity based on the synergetic approach. First, preparation for educational activity was conceptualised as an open, non-linear, self-developing system that includes motivational-value, cognitive-content and analytical-result components. Second, the integral mechanism unites synergetic (self-organisation, resonant non-linear guidance, bifurcation–attractor), corporate (corporate integration, cooperative collaboration, cluster, *ustoz–shogird*) and pedagogical-psychological (motivational, reflective, identification,

interiorisation) mechanisms and operates through an input–process–output–feedback algorithm within a four-block model. Third, the experiment involving 307 pre-service teachers showed that the mechanism significantly increases readiness on all three criteria: the share of high-level students in the EG rose from 16.7% to 37.2%, and the difference from the CG was statistically significant with a medium effect size. The mechanism can be used in bachelor's teacher education programmes, in retraining and in-service training of teachers and in pedagogical clusters. Future research should test it in master's programmes and examine the role of digital collaboration platforms in synergetic-corporate preparation.

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