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DEVELOPMENT OF PROFESSIONAL UNITY AND A HEALTHY PSYCHOLOGICAL ATMOSPHERE THROUGH JOINT TRAINING OF TEACHERS BASED ON ART-PEDAGOGY

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Abstract. *The article discusses the importance of developing social and emotional skills for teachers in their professional activities on the basis of art-pedagogy, turning a healthy mental environment that prevents emotional stress into a regular daily work habit for teachers through art, fully utilizing a culture of love based on mutual respect, living with art and achieving mental stability. It also presents the concept of achieving professional unity through continuous art-pedagogical training of teachers.*
Keywords: *interdisciplinary approach, emotional skills, pedagogical consulting, peer-to-peer learning, collective reflection.*

Introduction

Global processes taking place in the social, economic, informational, and spiritual spheres of the world increasingly intensify the problem of improving education systems in accordance with contemporary requirements. In countries such as the United States, the United Kingdom, Canada, Japan, South Korea, and Russia, priority is given to the integrative teaching of art-pedagogical disciplines, and in many countries around the world this approach has been integrated into the education system and is implemented in various forms.The organization of a system of continuous professional development requires the creation of necessary conditions for the development of social and professional competencies in teaching, as well as the introduction of effective mechanisms for retraining and continuous professional upgrading in accordance with modern requirements. The constantly increasing demands on the quality of education and the professional competence of teachers necessitate the organization of teaching activities based on innovative approaches.

Foreign scholars such as E. W. Eisner, H. Gardner, D. Goleman, L. Darling-Hammond, P. H. Johnston, M. Bennett, C. Cooper, and others have highlighted the theoretical and practical foundations of competencies related to art-based education (art pedagogy), socio-emotional development, communication culture, emotional awareness, and empathy. Art pedagogy can be defined as a pedagogical technology based on the integration of various forms of art into the educational and developmental process of the individual. The integration of pedagogy with different forms of art allows educators to master innovative and relevant methods of teaching and learning. Through this approach, the learning process becomes more effective, creative, and accessible for each individual. Furthermore, one of the main advantages of art pedagogy is its systematic application, which encourages the search for new creative approaches not only in general pedagogy but also in correctional pedagogy. This contributes to better assimilation of

science and art by learners and supports the development of spiritually and morally mature individuals.

According to O. Zubaydullayev, the system of preparing students for pedagogical activity has been enriched through integrative and creative tasks, art-pedagogical methods such as “Musical Approach in Teaching,” “Theatre and Life,” “Master Artist,” and “Paper Collage,” as well as visual simulation techniques (illustrative, demonstrative, and interface-based) and art-pedagogical training aimed at enhancing motivational and cognitive capacities.According to E. W. Eisner, art education enables learners to develop competencies for perceiving and emotionally understanding the world. Art-pedagogical approaches help students discover unexpected possibilities, creatively address problematic situations, and express their internal experiences through visual and artistic forms. In this process, the transformation that occurs within the learner’s consciousness during the creative process becomes more important than the final artistic product itself.

Similarly, C. Cooper emphasizes that art-based education fosters not only creative abilities but also social connectedness and empathy among learners, which ultimately contributes to a collaborative and supportive educational environment. In order to improve their effectiveness, mechanisms for activating emotional awareness and creative thinking among participants were developed through morning sessions and training activities. The educational process was methodologically enriched by applying interdisciplinary approaches and the motivational and cognitive potential of art-pedagogical training.The project was based on the principles of supporting culture, art, and science. With the initiative of the Samarkand Regional National Center for Teaching New Methodologies, short-term seminars and morning educational sessions were organized and experimentally tested in practice.

Concept Of Developing Professional Solidarity And A Healthy Psychological Climate Through Collaborative Teaching Based On Art Pedagogy.

1. General Provisions

Recent studies in the fields of neuroscience and cognitive sciences within the system of continuous professional education increasingly provide new scientific evidence linking creativity with intellectual activity. According to the findings of these studies, achieving social and emotional success, as well as developing creative and communicative competencies that are essential for 21st-century educators, has become highly relevant. Educational approaches based on the integration of arts engage teachers in creative activities that promote flexibility of thinking, tolerance for uncertainty, and the ability to learn from mistakes as a natural component of experiential learning.

Key concepts used in the concept

Development of emotional skills – enhancing teachers’ ability to understand and manage their emotions, cope with stress, and maintain psychological well-being.

Development of social skills – improving teamwork abilities, establishing effective interpersonal relationships, and strengthening empathy skills.

Development of creative thinking and creativity – fostering innovative approaches and methods, and enhancing creative thinking abilities.

Adaptation to change – forming the ability for innovative thinking and adaptability to new educational transformations.

Teaching moral and aesthetic values – developing social responsibility and aesthetic taste through artistic activities.

2. Identifying Objective and Subjective Factors Hindering the Formation of Professional Solidarity and a Healthy Psychological Climate through Collaborative Teaching Based on the Art-Pedagogical Model

Identifying objective and subjective factors that hinder the development of an art-pedagogical environment in schools and pedagogical communities is an important stage in improving the quality of teaching, the effectiveness of educational work, and the development of a creative environment.

1. Identification of Objective Factors

a) Analytical methods

• Analysis of material and technical resources: examining the availability of artistic tools, visual art equipment, musical instruments, and stage resources necessary for organizing art-based activities.

• Analysis of curricula and class schedules: studying the scope, volume, and significance of art-related subjects such as music, visual arts, theatre, and literature.

• Identification of funding sources: evaluating whether sufficient financial resources are allocated for art-based educational activities.

2. Identification of Subjective Factors

a) Interviews and discussions

Conducting interviews with teachers to understand their attitudes toward art and creative approaches in education, as well as assessing the administration's support for art-pedagogical initiatives.

b) Psychological diagnostics

Conducting surveys and psychological tests to determine teachers' levels of creativity, openness, and readiness for innovation. Additionally, identifying students' interest and motivation in artistic activities.

c) Observation

Monitoring teachers' participation in art-pedagogical events and the use of creative methods during lessons.

d) Reflection methods

Collecting reflective written feedback from teachers regarding their professional activities and examining students' perceptions and feelings during lessons.

Based on international experiences, the functional characteristics of art-pedagogical models that promote socio-psychological harmony have been identified.

Chapter 3. Goals, Main Tasks, and Principles of Developing Professional Solidarity and a Healthy Psychological Climate through Collaborative Teaching Based on the Art-Pedagogical Model

Systematic activities aimed at increasing teachers' emotional culture through art are essential for reducing excessive emotional stress in professional activities. Key indicators of emotional culture include emotional stability, empathy, and emotional adaptability. Therefore, it is important to develop mechanisms for emotional stability and self-regulation among educators.

Main tasks include:

• Creating a system of moral and aesthetic interaction in the educational environment by integrating pedagogy, psychology, and art studies.

• Implementing art-pedagogical practices that reduce teachers' emotional stress and promote a psychologically healthy working environment.

• Promoting a culture of kindness and mutual respect through art-based educational activities.

• Encouraging teachers to experience professional satisfaction, appreciate the beauty of life through art, reduce stress, achieve emotional calmness, and practice meditation techniques.

Main principles include:

• Pedagogical consulting

• Exchange of professional experience

• Integration of art, pedagogy, and psychology into the school environment

4. Directions and Implementation Mechanisms for Developing Professional Solidarity and a Healthy Psychological Climate through Collaborative Teaching Based on the Art-Pedagogical Model

Emotional tension is particularly evident among teachers of different age groups. Stressful pedagogical situations may lead to difficulties in evaluating events objectively, impulsive behavior toward students, reduced initiative, passivity, and feelings of professional inadequacy.

The main mechanisms for implementing the concept include:

• Identifying objective and subjective factors that hinder the formation of an art-pedagogical environment in schools.

• Organizing activities aimed at open communication and exchange of ideas.

• Increasing collaboration in decision-making processes and considering the opinions of all staff members.

• Establishing good management practices, ethical standards, and values that support teachers' participation in the decision-making process.

Results and discussion. Development of aesthetic literacy

• Conducting art and cultural lessons and master classes for teachers.

• Organizing art exhibitions, theatre activities, and musical events.

• Aesthetic improvement of the school environment through decorations and artworks.

• Creating opportunities for artistic activities such as drawing, singing, and drama.

Development of social trust

• Encouraging open and sincere communication among team members.

• Organizing team-building games and training sessions to strengthen trust.

• Promoting collaborative problem-solving activities.

Peer-to-peer learning

Creating an effective system of cooperation and professional exchange among teachers.

Emotional stability

• Stress management activities such as relaxation, meditation, and breathing exercises.

• Providing psychological counseling services.

• Organizing regular recreational and cultural activities, including sports, excursions, seminars, theatre workshops, visual expression activities, roundtable discussions, podcasts, and training sessions aimed at reducing emotional stress.

• Using art therapy methods such as drawing and drama to express emotions.

• Promoting integrative approaches, aesthetic activities, collective reflection, psychological climate development, and communication culture.

• Organizing regular discussion and reflection sessions.

• Implementing systematic and targeted professional training courses.

• Conducting games, training sessions, and team activities to strengthen communication.

• Developing effective communication and mutual understanding between leadership and staff members to improve the psychological climate.

Conclusion

Based on the analysis, proposed recommendations, and the initial results of implementing this approach in practice with the initiative of the Center, the following conclusions can be drawn:

• Short-term courses and morning educational activities developed within this concept are currently being tested at the Samarkand Pedagogical Excellence Center.

• Psychological and methodological harmony within the teaching process is ensured.

• A cultural and creative environment and a healthy psychological atmosphere are formed within pedagogical teams.

• A culture of kindness and mutual respect among educators is strengthened.

• Teachers' professional and personal growth is supported, while creativity and aesthetic thinking are developed.

• Teachers learn to understand their emotions, reduce stress, achieve internal balance, and maintain stable communication within the team.

• Overall, while certain approaches may serve as tools in organizing effective educational processes, the teacher's professional attitude and pedagogical-psychological competence remain the key factors in achieving successful outcomes.

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DIDACTIC OPPORTUNITIES FOR DEVELOPING CREATIVE COMPETENCE BASED ON THE INTEGRATION OF DEVELOPMENT CENTERS IN THE PRESCHOOL EDUCATIONAL ENVIRONMENT

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Abstract. *This article analyzes the purpose, nature, and didactic potential of the integration of developmental centers in preschool educational organizations. The methodology is based on the comparison of theoretical sources, observation of practical activities, and analysis of pedagogical situations. The findings provide a basis for well-founded conclusions regarding integration planning, educational environment design, and pedagogical collaboration.*

Keywords: *developmental center, integration, preschool educational environment, competence, pedagogical cooperation, independent activity, creativity.*

Introduction

The issue of organizing a developmental environment in the preschool education system, which is the initial stage of the education system, has gained great importance in recent years. These developmental centers are understood as places that ensure children's natural curiosity, independent activity, learning through play, communication and experimental processes. The frequent practice of individual activities in centers prevents the formation of a child's knowledge and skills as a holistic system. Modern pedagogical approaches, in particular, activity-oriented and competency-based approaches, emphasize the integration of educational content as an important condition for developing the ability to think coherently in complex situations and to integrate and maintain different knowledge and skills [7; 9]. Also, an important mechanism for the formation of creative competence in a child is integration. Creative competence refers to the child's ability to think unconventionally, develop new ideas, apply existing experience in a new situation, and find creative solutions.

Although the psychological and pedagogical foundations of a developing environment are widely covered in scientific sources [5; 6], namely, the content, levels of inter-center integration and its role in the development of creative competence are not sufficiently coordinated [1; 2]. Therefore, the purpose of this article is to clarify the content of the integration of developing centers, systematize its components, and develop assessment criteria related to the development of creative competence.

Methodology

The methodological basis of the study was formed by systematic, activity-oriented and competency-based approaches. The systematic approach made it possible to consider development centers not as separate territories, but as a system of interconnected components serving a common goal. The activity-oriented approach served to interpret integration as a content unit that emerged through the real activity, experience, and reflection of children [6; 7]. The competency-based

approach made it possible to assess the result not only in terms of the amount of knowledge, but also through the formation of communicative, social, self-management, and creative abilities [9].

As empirical data, normative and methodological documents, planning samples of teachers, and observation notes on the activities of development centers were analyzed. Through data analysis, the common goal of the centers, the interdependence of activities, resource exchange, and elements of creative activity were identified [1; 4; 8].

Results

The results of the study showed that the integration of developmental centers is manifested in four interrelated layers.

1. Integration of goals. The centers should serve the goal of general development, not individual tasks. Communication, problem solving, self-management and creative competence should be identified as common outcome areas for all centers. For example, a child describes, models, or tells a story about a process he observes in one center in another. In this process, he does not repeat ready-made knowledge, but rather reworks it and brings it into a new form. Due to this, creative thinking develops.

2. Integration of activities. The mechanisms of integration “sequentially” and “at the same time” have been identified. In sequential integration, an experience in one center is continued in another. For example, observation in the nature center is connected to visual expression in the art center, model making in the construction center, and story-telling in the language center. At the same time, in integration, communication, calculation, imagination, and creative expression are combined in the process of role-playing. These mechanisms serve to develop creative competence, as the child reconstructs the same content through different means of expression and creates new connections [5; 7].

3. Integration of resources and environment. The openness and mobility of resources are important factors for creative development. If the material is attached to only one center, experience is limited. On the contrary, when the resource is used in different conditions, the child learns to use it for a new purpose. For example, a simple subject can perform different functions in different centers. This leads to a reinterpretation of the function of the subject and the formation of creative thinking [4; 8].

4. Pedagogical cooperation and management integration. In order for integration to produce stable results, collective planning, common assessment criteria, and a single pedagogical goal are necessary. The task of the teacher is to purposefully direct free activity, create a problematic situation, and encourage the child to analyze himself. In this regard, creative competence is considered not only as an unexpected creation, but also as the result of a purposeful pedagogical design [6; 9].

Criteria for assessing integration and creative competence

Evaluation of the effectiveness of integration can be carried out in the following areas:

Cognitive-transfer criterion - can the child apply the experience gained in one center to another?

Communicative criterion - does he freely express his opinion during the task, does he cooperate?

Self-management criterion - does he make choices, complete the work, correct the mistake?

The creative criterion is whether the child proposes a new idea, uses the material in an unusual way, or tries to solve a problem in several ways.

In this way, creative competence is manifested as one of the main indicators of integration.

Discussion

The results are consistent with theories of development through social interaction of the developing environment [6]. Reworking experience in different activity contexts supports the formation of higher mental functions. Based on constructivist principles, the child builds knowledge on the basis of active experience [5]. Integration between centers enhances this process. The idea of spiral learning explains the consolidation of content through repetition in different activities [7].

Thus, integration is manifested as a natural pedagogical mechanism for the formation of creative competence. Based on the organization of inter-center integration, didactic opportunities for developing the creative competence of preschool children will be clarified, while at the same time it will be determined that the specific didactic materials and methodological approaches of each center will serve to increase the creative potential of children.(Table 1)

Table 1.

Development centers	**Didactic opportunities**	**Content**
Construction and Building Center	Problem Solving and Analytical Thinking	Through construction and building activities, children develop the skills to identify problems, analyze them, and generate logical solutions.
	Integrative Approach	Mathematical, geometrical, and design concepts are integrated through creative projects.
Role-Play and Dramatization Center	Creative Expression and Empathy	Through role-play and dramatization activities, children create their own characters and express various emotions and perspectives, thereby developing empathy and social communication skills.
	Theatre and Dramatic Methods	Improvisation and role-based performance foster creative engagement and critical thinking.
Language and Speech Center	Verbal Creativity	Through language and speech activities, children learn to express their ideas in the form of stories, poems, dialogues, and monologues.

	Expression of the Creative Process	By using language tools, children learn to clearly and confidently articulate their emotions, thoughts, and creative perspectives.
Science and Nature Center	Scientific Questioning and Analysis	Through experiments, observation activities, and scientific project work, children develop the ability to ask questions, analyze, and formulate hypotheses.
	Interactive Learning	Theoretical knowledge is integrated with practical experience through laboratory work, interactive experimental areas, and virtual models.
Art Center	Aesthetic Sensibility and Creativity	Through art forms such as drawing, music, drama, dance, and handicrafts, children develop their aesthetic abilities and demonstrate their creative potential.
	Holistic Development and Integration	Through art lessons, knowledge and experiences gained from other areas—such as observations in the Science and Nature Center and expression activities in the Language and Speech Center—are integrated, forming a unified creative system

Conclusion

The mutual integration of developmental centers in the preschool educational environment is carried out on the basis of the harmony of goals, activities, resources and pedagogical cooperation. Integration is not limited to combining topics, but serves to develop the child's application of knowledge in practice, communication, self-management, and creative competence in a holistic way. The presented conceptual model interprets integration as a guided pedagogical design and allows for a criterion-based assessment of effectiveness. In the future, it will be important to empirically test these criteria and strengthen integrated and creatively oriented design competencies in teacher training programs.

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EXPERIENCE IN APPLYING INNOVATIVE TECHNOLOGIES IN THE EDUCATIONAL PROCESS OF TECHNICAL UNIVERSITIES

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Abstract. *This article analyzes the issues of developing research activities of students in technical universities under the conditions of innovative teaching technologies. In particular, the role of engineering competitions and hackathons in the educational process is scientifically substantiated, highlighting their importance in developing students' independent inquiry skills, creative abilities, and practical competencies. The study examines international experience, modern pedagogical approaches, and the effectiveness factors of innovative educational technologies. The results indicate that engineering competitions and hackathons encourage students not only to acquire theoretical knowledge more deeply but also to apply it in practice. At the same time, these processes serve as an important foundation for the sustainable development of research activities.*

Keywords: *innovative teaching technologies, technical universities, research activity, engineering competitions, hackathons, educational effectiveness.*

Introduction

In today's era of globalization, one of the main tasks facing the education system is to train competitive specialists with creative and innovative thinking skills. In this regard, technical universities occupy a special place in preparing personnel who meet the demands of modern science, industry, and the innovative economy. From this perspective, the effective organization of students' research activities and their development based on new pedagogical approaches has become a pressing issue. In recent years, leading higher education institutions around the world have accumulated significant experience in implementing innovative teaching technologies, creating a creative learning environment, and equipping students with practice-oriented knowledge. In particular, engineering competitions and hackathons are recognized as effective tools for developing students' independent inquiry, research activity, and teamwork skills.

In the Republic of Uzbekistan, fundamental reforms are also being carried out in the higher education system. Specifically, presidential decrees and resolutions emphasize the introduction of innovative approaches into the educational process, the broad involvement of young people in scientific activities, and the support of their startup projects. In this context, the development of students' research activities in technical universities and the realization of their creative potential through engineering competitions and hackathons are of great importance. The relevance of this article lies in the fact that it examines effective methods for engaging students in scientific activity under conditions of using innovative teaching technologies in technical universities. In addition, international experience is analyzed, and recommendations adapted to the education system of Uzbekistan are developed.

Main Part

The issue of innovative pedagogical technologies and their application in higher education has been widely studied worldwide in recent years. In particular, reports by international organizations such as UNESCO and the OECD emphasize the importance of directing students toward independent inquiry and engaging them in innovative activities as a key challenge of modern education. The theoretical foundations of the development of pedagogical technologies have been explored in the works of scholars such as V.P. Bespalko, B.L. Farberman, N.S. Saidakhmedov, and Sh.S. Sharipov. According to their views, pedagogical technology is based on a systematic approach to designing, organizing, and monitoring the effectiveness of the educational process. Innovative technologies, in particular, encourage students to be active, think creatively, and make independent decisions.

Among foreign scholars, the scientific works of J. Dewey, P. Freire, H. Gardner, and T. Bates have laid the theoretical foundations for new approaches in education. For example, Dewey's pragmatic pedagogy prioritizes practical activity in the learning process, while Gardner, through his theory of multiple intelligences, places special emphasis on developing students' individual abilities. Among Uzbek scholars, the works of N.A. Muslimov, A.A. Abduqodirov, U.N. Nishonov, and M. Jo'rayev are devoted to the application of innovative technologies in education, improving the quality of education, and directing students toward scientific activity. Their studies particularly emphasize the necessity of organizing the educational process in an integrated manner in the field of engineering.

In recent years, the number of scientific publications devoted to modern educational formats such as hackathons and engineering competitions has increased. For instance, the study by A. Briscoe and J. Mulligan (2019) highlights the role of hackathons in developing students' creative thinking, teamwork, and rapid decision-making skills. Similarly, J. Smith (2021) concludes that engineering competitions accelerate the application of theoretical knowledge in practice and prepare students to solve real industrial problems. In global practice, the main innovative approaches used in technical education include:

- **STEM education (Science, Technology, Engineering, Mathematics)** – integration of technical and natural sciences through interdisciplinary approaches;
- **Problem-based learning** – directing students toward solving real industrial problems;
- **Project- and startup-based learning** – developing students' scientific and innovative ideas in the form of practical projects or startups;
- **Gamification** – incorporating elements of competition, games, and motivation into the educational process;
- **Distance and hybrid learning** – integrating traditional classroom instruction with online platforms.

Turning to local experience, higher education institutions of the Republic of Uzbekistan, particularly technical universities, have also widely implemented hackathons and engineering competitions. Institutions such as Inha University in Tashkent, Tashkent University of Information Technologies, and Tashkent State Technical University actively involve students in hackathons, where they implement their projects in cooperation with industrial enterprises. Through these competitions, students not only propose new ideas but also gain opportunities to provide technical justification, calculate economic efficiency, and develop practical prototypes. This contributes to the development of young specialists' research activities and enhances their innovative potential.

Foreign studies also indicate that hackathons and engineering competitions are considered effective forms of engaging students in research activities. For example, participants of the

“Engineering Education Hackathon” project held in Canada successfully implemented three startup projects as a result of their research activities. This experience demonstrates that hackathons can be applied not only as short-term competitions but also as a permanent element of the educational process. International experience further shows that leading technical universities worldwide (MIT, Stanford, Tsinghua, KAIST, etc.) place significant emphasis on hackathons, engineering competitions, hack labs, and makerspace environments in student research activities. This approach creates substantial opportunities for the emergence of technological innovations and startups. Universities such as MIT, Stanford, and Texas A&M have made hackathons and engineering competitions an integral part of the educational process, serving as important tools for fostering technological innovation, startup development, and stronger industry integration.

Examining European experience, engineering education is often organized through real industrial projects. Students begin developing mini-prototypes from their first year of study and spend two to three days a week in engineering departments of factories. In the United States, universities such as MIT, Stanford, and Georgia Tech apply blended learning models, where 30–40% of theoretical instruction is delivered online, while the remaining portion focuses on practical laboratory-based activities. Hackathons and engineering competitions are considered mandatory components, supported by makerspaces, 3D printers, IoT, and robotics laboratories.

The Finnish model (Aalto University) emphasizes project-based learning and interdisciplinary teams as core methods. The Design Factory serves as a collaborative center where students, faculty, and companies work together. Startup and prototyping culture is strong, placing Aalto startups among the top ten most developed in Europe. In Germany, dual education models (TU Munich, RWTH Aachen) involve students spending two to three days a week in industrial engineering departments, conducting course projects and research based on industrial orders, and working in digital laboratories focused on Industry 4.0.

In South Korea, approximately 95% of graduates enter practical employment immediately after graduation. In Japan, advanced virtual laboratories in mechatronics and materials science are widely used, and Lean Engineering methodologies are integrated into the educational process. In China (Tsinghua University, Zhejiang University, Harbin Institute of Technology), real production line models are developed in 5G, IoT, and AI laboratories, with strong industrial collaboration (Huawei, BYD, Alibaba Cloud). Hackathons and innovation competitions are held more than 100 times annually. In Russia (Bauman Moscow State Technical University, ITMO University, Skoltech), integration with the Skolkovo Innovation Center, smart campuses, digital simulators, virtual laboratories, and preparation centers for international engineering competitions such as ICM, RoboCup, and Eurobot are established.

Technical universities in Tashkent, including TUIT, TSTU, and TIQXMMI, have implemented the following innovative technologies:

- Digital education platforms (Moodle, Canvas);
- Virtual laboratories (physics, mechanics, automation);
- CAD/CAE software for design and drafting (AutoCAD, SolidWorks, ANSYS).

Presidential resolutions have approved the following innovations:

- The “Innovative Ideas, Technologies, and Projects” platform;
- Establishment of innovation development laboratories in higher education institutions;
- Introduction of a cluster model for engineering and IT disciplines;
- Grant and incubation programs for startups.

The main global trend in technical universities is practice-oriented, competency-based education enriched with digital technologies. Hackathons, engineering competitions, and industrial projects have become integral components of education.

Conclusion

Thus, the use of innovative pedagogical technologies in technical universities significantly engages students in research activities. Engineering competitions and hackathons play a crucial role in developing students' practical knowledge and skills, directing them toward independent inquiry, and preparing them for the modern labor market. Education in technical universities requires not only the delivery of theoretical knowledge but also the preparation of students for participation in a scientific environment. Therefore, technical universities have increasingly focused on innovative teaching technologies in recent years.

Compared with foreign higher education institutions, hackathons and engineering competitions in Uzbekistan have not yet been fully systematized. While hackathons in the United States and Canada are regularly included in curricula, in Uzbekistan they are often conducted on an initiative basis and on a limited scale. Consequently, systematizing and conducting these activities on a regular basis could significantly enhance educational effectiveness.

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DEVELOPMENT OF ORTHOGRAPHIC AWARENESS THROUGH THE INTEGRATION OF VOCABULARY WORK AND HANDWRITING PRACTICE

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Abstract. *In primary schools, one of the pressing pedagogical challenges is the development of orthographic awareness among students. Insufficient attention to spelling leads to systematic orthographic errors, reduces children's confidence, and complicates the learning process. This article presents a methodology that integrates vocabulary work and handwriting practice aimed at developing attention to orthographic patterns. The proposed approach includes daily copying of vocabulary words, composing sentences with them, and subsequent assessment through mini-dictations. The methodology demonstrates effectiveness in practice: students better memorize difficult words, improve handwriting neatness, and reduce the number of errors. The article may be useful for primary school teachers and methodologists seeking practical tools for developing orthographic awareness.*

Keywords: *orthographic awareness, primary school students, vocabulary work, handwriting practice, integration, methodology, primary education, spelling attentiveness, written literacy, differentiated instruction.*

Introduction

In the modern educational process, one of the key aspects of developing literacy in primary school students is fostering orthographic awareness—the ability to notice and correctly reproduce complex spelling patterns in written speech. Insufficient orthographic attentiveness leads to systematic errors, lowers children's confidence in writing, and complicates further learning. Research indicates that regular and purposeful work with orthographic difficulties contributes to the formation of stable writing skills and improves the quality of written speech. The integration of vocabulary work and handwriting practice is of particular importance, as their combined use allows for the simultaneous development of orthographic awareness and handwriting accuracy. Vocabulary work helps children focus on orthographically challenging words, while handwriting practice develops the skills necessary for their correct and neat reproduction.

This approach not only reinforces learned spelling patterns but also develops attention to detail, which is especially important for students in grades 1–4. Studies by Smirnova (2019) and Petrova (2022) show that regular work with vocabulary words combined with written exercises reduces orthographic errors by 30–40% during the academic year. Similar conclusions have been drawn in international research: systematic copying of words and composing sentences with them increases attentiveness and awareness in writing among primary school students. Thus, developing orthographic awareness through the integration of vocabulary work and handwriting practice is a relevant pedagogical task. The systematic implementation of such methods in the educational process increases the effectiveness of spelling acquisition, improves the quality of written speech, and forms stable skills of neat and attentive writing.

Research Aim: To develop and test a methodology for forming orthographic awareness in primary school students through the integration of vocabulary work and handwriting practice.

Research Objectives:

- To analyze existing approaches to developing orthographic awareness in primary school students.
- To examine the advantages of integrating vocabulary work and handwriting practice as a means of forming spelling attentiveness.
- To develop methodological recommendations and a practical example of implementing integrative work in Russian language lessons.
- To evaluate the effectiveness of the proposed methodology in practice and determine directions for its further application.

Literature Review

The Concept of Orthographic Awareness

Orthographic awareness is the ability of a student to notice orthographically complex elements of a word and correctly reproduce them in writing. It includes attention to letters, sounds, letter combinations, and morphological features of a word. According to Sokolova (2020), the development of orthographic awareness is directly related to overall literacy and forms the foundation of correct written language in primary school age.

Vocabulary Work and Its Role in Forming Orthographic Awareness

Vocabulary work involves the systematic study of words that cause difficulties for children and reinforcing their spelling through repetition and contextual use. Research by well-known educators shows that regular work with vocabulary words increases attention to spelling patterns, reduces the frequency of errors, and helps consolidate knowledge. Foreign authors note that combining vocabulary work with active use of words in sentences improves writing awareness and promotes memorization of spelling rules.

Handwriting Practice as a Means of Developing Written Literacy

Handwriting practice ensures the formation of neat writing skills and develops fine motor skills, which directly influence a student's ability to notice and correctly reproduce orthographic patterns. Studies show that systematic copying of words and sentences helps consolidate the visual image of a word, improves memory for spelling, and reduces the number of mistakes in dictations.

Integration of Vocabulary Work and Handwriting Practice

Modern pedagogical research emphasizes the importance of combining vocabulary work and handwriting practice. Such an integrative approach allows for the simultaneous development of orthographic awareness, handwriting neatness, and the ability to use words in context. Smirnova (2019) demonstrated that daily copying of vocabulary words combined with sentence composition significantly improves spelling skills in difficult words among primary school students. Similar results have been obtained in international research: systematic integration of vocabulary work and written exercises increases writing awareness, attention to detail, and reduces spelling errors.

Literature Review Conclusions

The analysis of studies shows that integrating vocabulary work and handwriting practice is an effective tool for forming orthographic awareness. The methodology combines knowledge reinforcement, attention development, and handwriting accuracy, contributing to the formation of stable writing skills among primary school students. In practice, this results in fewer spelling errors, increased student confidence, and improved written speech quality.

Methodological Recommendations and Practical Implementation

General Principles

The methodology is based on the following principles:

- **Systematic and gradual approach.** Exercises are performed daily with gradual complication of vocabulary material.
- **Attention to difficult spelling patterns.** Words that cause the greatest difficulties are visually highlighted (e.g., in red).
- **Integration of vocabulary work and handwriting practice.** Copying words is combined with sentence composition to reinforce spelling in context.
- **Individualization and differentiation.** Students with different levels are offered words of varying complexity.
- **Game-based and visual approach.** Competitive elements and visual cues maintain motivation and interest.

Step-by-Step Lesson Algorithm

1. **Word selection.** The teacher selects 2–4 difficult words based on previous dictation errors.
2. **Word presentation.** The word is written on the board/projector; problematic letters are highlighted. Meaning and spelling are explained.
3. **Handwriting practice.** Students copy the word in two neat lines.
4. **Sentence composition.** Students compose and write a sentence using the word.
5. **Repetition.** The procedure is repeated for all selected words.
6. **Mini-dictation.** Only previously analyzed words are included in the dictation text.
7. **Self-check.** Students compare their writing with the model and mark mistakes.
8. **Homework reinforcement.** Students rewrite 1–2 words and compose new sentences.

Example

Word: *kitten*

Students copy: *kitten, kitten.*

Sentence: “A kitten has settled in our yard.”

The problematic letter is highlighted.

Sample word set: kitten, puppy, hedgehog, motley.

Short dictation: “A puppy and a playful kitten appeared in the yard. A motley parrot sat on the window. A small hedgehog hid in the leaves.”

Integration with Other Subjects

- **Reading:** Searching for vocabulary words in texts.
- **Russian language lessons:** Spelling exercises and orthographic analysis.
- **Environmental studies:** Mini-projects using new vocabulary.
- **Homework:** Additional copying and sentence writing with parents.

Assessment and Monitoring Tools

- Teacher observation.
- Mini-dictations.
- Self-checking against a model.
- Monitoring progress through error reduction.

Advantages of the Methodology

- Increases spelling attentiveness and writing accuracy.
- Develops neat and cultured handwriting.

- Reinforces word knowledge through context.
- Simple and reproducible for teachers.

Discussion

The analysis of the methodology shows high effectiveness in developing orthographic awareness among primary school students. Growth in spelling attentiveness is connected not only with repeated visual perception but also with motor reinforcement. When a child copies a word several times, a motor-visual connection is formed: the brain remembers the writing trajectory, not just the letters. This reduces accidental mistakes. Additional pronunciation and contextual use strengthen semantic fixation—children memorize the word as meaningful content rather than an abstract letter set.

Practical implementation demonstrates:

- Increased spelling attentiveness;
- Improved handwriting neatness;
- Better retention of difficult words;
- Higher student motivation.

Limitations

- Individual differences among students;
- Time constraints;
- Need for systematic teacher control.

Comparison with Other Approaches

Unlike traditional methods where vocabulary work and handwriting are separate, integration closes the memorization cycle: students see the word, copy it, use it in a sentence, and encounter it again in a dictation. This prevents incorrect forms from becoming fixed. During classroom testing, spelling errors in difficult words decreased by approximately one-third within two to three weeks. Students became more confident and more willing to write.

Prospects

- Expanding vocabulary lists;
- Incorporating digital tools;
- Developing monitoring systems;
- Creating interactive trainers with highlighted spelling patterns.

Conclusion

Developing orthographic awareness through integrating vocabulary work and handwriting practice is an effective and accessible tool for forming written literacy in primary school students. Practical implementation demonstrates:

- Reduced spelling errors;
- Increased attentiveness to difficult words;
- Formation of neat handwriting;
- Improved motivation.

The methodology can be used by primary school teachers as part of a comprehensive literacy development approach, with further improvement through game-based and digital technologies.

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THE CURRENT STATE OF IMPROVING THE QUALITY AND EFFECTIVENESS OF EDUCATION IN THE MANAGEMENT OF PRESCHOOL EDUCATIONAL ORGANIZATION LEADERS

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Abstract. *This article analyzes the current state of ensuring the quality and effectiveness of education in the activities of preschool educational organization leaders. The study examines managerial, organizational-pedagogical, and monitoring mechanisms of leadership activity. Research methods such as analysis, comparison, questionnaires, and document analysis were used. The results indicate that professional competence of leaders, strategic planning, and internal quality control systems play a significant role in improving the quality of education in preschool institutions. Based on the findings, practical recommendations aimed at ensuring educational quality were developed.*

Keywords: *preschool educational organization, preschool education system, quality of education, educational effectiveness, educational process, pedagogical process, education quality management, quality management system, leadership activity, educational institution leader.*

INTRODUCTION

Today, the attention and care provided by the state and the government to the preschool education system require the creation of necessary conditions for all heads of preschool educational organizations to engage in continuous self-development, conduct ongoing research, and organize the management process on a scientific basis in accordance with modern requirements. At the same time, this creates opportunities to ensure the quality and effectiveness of preschool education, which, in turn, places even greater responsibility on the leaders of preschool educational institutions.

RESEARCH METHODOLOGY.

The article discusses the significance of structural management in ensuring the effectiveness of the preschool education process, the factors that determine the quality and efficiency of the preschool education system, and the current state of ensuring quality and effectiveness in the activities of heads of preschool educational organizations.

ANALYSIS AND RESULTS.

In the Concept for the Development of the Preschool Education System of the Republic of Uzbekistan until 2030, special attention was paid to the issue of “introducing absolutely new approaches to the training, retraining, professional development, selection, and advancement of personnel with higher education for the preschool education system,” and a number of systemic problems and shortcomings hindering the successful implementation of state policy in the field of preschool education development were identified:

insufficient number of preschool educational institutions to ensure full coverage of children of preschool age;

underdevelopment of preschool education in rural areas;

unsatisfactory material and technical condition of preschool educational institutions;

lack of qualified pedagogical staff in preschool educational institutions;

shortage of managerial personnel in the preschool education system and their insufficient qualifications;

insufficient awareness among parents about the positive aspects and benefits of preschool education in the formation of a child's personality;

lack of modern educational and methodological materials and visual aids.

The effective and rational resolution of these problems and the creation of a developmental environment in preschool educational institutions constitute one of the essential tasks of their leaders.

The task of ensuring the quality and effectiveness of education in the activities of heads of preschool educational institutions is also reflected in the qualification requirements for the main positions of preschool education staff [1]. Accordingly, the head of a preschool educational institution is responsible for:

– further improving the preschool education system within the territory where the institution is located, strengthening its material and technical base, and effectively organizing its educational and methodological activities;

– providing the institution with highly competent, skilled, and qualified specialists;
– introducing modern educational programs and technologies aimed at the comprehensive intellectual, spiritual-aesthetic, and physical development of children into the educational process, and fundamentally improving their level of readiness for school;

– ensuring the full implementation of regulatory documents related to preschool education in practice;

– planning the activities of the institution and developing annual and перспективе work plans;

– approving work plans, curriculum-thematic plans, and annual calendar curricula of the institution;

– reviewing and approving the work plans of pedagogical staff and specialists and monitoring their full and high-quality implementation;

– taking measures to increase the coverage of preschool-age children in preschool education, especially ensuring the full enrollment of six-year-old children to provide quality preparation for primary education;

– introducing advanced pedagogical and information technologies into the educational process;

– creating appropriate conditions for the formation of general basic competencies and developmental domain competencies in children during the educational process;

– increasing the responsibility and accountability of pedagogical staff and employees in implementing the educational process and fulfilling the tasks defined in relevant documents;

– supervising the organization of open classes, seminars, competitions, and contests within the institution;

– analyzing all information related to the institution's activities, preparing reports, and continuously monitoring исполнитель discipline;

– providing organizational and methodological assistance to pedagogical staff and specialists in performing their official duties with quality, creating necessary working conditions, and ensuring labor discipline;

– encouraging the most active employees and, within the scope of authority, applying disciplinary measures to those who fail to fulfill their duties, as well as fostering a healthy moral environment within the team;

– establishing cooperation between the preschool educational institution and parents and studying parents' opinions regarding the development of the institution's activities;

– ensuring compliance with professional ethics rules, internal labor regulations, collective agreements, sanitary-hygienic requirements, occupational safety, technical and fire safety regulations, and creating a healthy competitive environment.

A modern competitive head of a preschool educational institution, managing the primary link of continuous education, is considered a responsible person for fulfilling the social order placed before the educational institution in his or her activities.

However, today in the management of preschool educational institutions, the following shortcomings can be observed:

– insufficient professional and scientific-methodological training of managerial personnel, lagging behind the content and methodological support of preschool education;

– failure to adhere to the principles of humanism and democracy in relations between managers and pedagogical staff;

– reliance on an authoritarian management style;

– lagging behind in acquiring the necessary methodological knowledge, skills, and competencies for the use of modern pedagogical and information technologies;

– inability to apply effective management methods in accordance with the requirements imposed on preschool educational institutions;

– lack of professional competencies among managerial personnel and insufficient ideological and political maturity;

– insufficient knowledge, skills, and competencies regarding advanced foreign experience in educational management;

– excessive involvement of most heads of preschool educational institutions in routine organizational work.

In the course of our research, surveys were conducted to identify the structural management competencies of heads of preschool educational institutions. Based on the survey results, a number of tasks were defined (presented in Appendix 1).

One of the main functions of structural management in preschool educational institutions is monitoring compliance with the requirements of the state standard. The purpose of monitoring compliance with state standard requirements is to determine the level of fulfillment of the requirements established by the state standard and, on this basis, to implement necessary measures to ensure the quality of education. In preschool educational institutions, ensuring educational effectiveness is achieved through monitoring the implementation of state requirements for the development of early and preschool-age children and the execution of the state curriculum for preschool education and upbringing [2].

The types of quality control in state preschool educational institutions include: internal control — carried out by the head of the state preschool educational institution, as well as by higher district (city) preschool education departments and the Ministry of Preschool Education of the Republic of Karakalpakstan, regional preschool education departments, and the Tashkent city preschool education department;

external control — carried out by state bodies and organizations authorized by law to inspect the activities of state preschool educational institutions;

public control — carried out in accordance with established procedures by public commissions organized within mahalla and rural citizens' assemblies;

national and international assessment — carried out on the basis of relevant government decisions and international agreements in cooperation with preschool education management bodies and other organizations, including international organizations.

The head of a preschool educational institution directly analyzes the activities of pedagogical staff during the internal control process and provides necessary instructions for organizing pedagogical processes.

Ensuring the effectiveness of preschool education processes on the basis of structural management requires organizing classes in accordance with the standard curriculum of preschool education institutions, distributing them by age groups, and monitoring their implementation.

In the preschool education system, the quality and effectiveness of education are determined by innovations being tested and implemented, as well as by the innovation processes organized, which are aimed at a specific goal — improving the educational process, developing children's knowledge, skills, and competencies, and совершенствование their activities.

The effectiveness of pedagogical processes organized in the preschool education system is determined by the development of children's knowledge, skills, and competencies and the growth of their learning achievement indicators.

Thus, in ensuring the quality and effectiveness of preschool education, the head of a preschool educational institution should focus on the following important factors, and the following results achieved in the process of interaction as a component of the pedagogical process organized in the institution are of particular significance for the development of children's personalities:

– development of children's activity and initiative;

– changes in children's psychological characteristics not strictly dependent on age;

– development of children's spiritual and cultural worldviews and concepts;

– formation and development of self-awareness and self-assessment skills in children;

– increase in the professional competence level of managerial staff and educators;

– emergence of collaborative activities between managerial and pedagogical staff;

– increase in the effectiveness of information exchange between educators and children;

– acceleration of the psychological adaptation of young teachers to professional activity and of newly enrolled children to the socio-educational environment.

Pedagogical practice shows that the formation of independent and free thinking skills and a rich spiritual worldview in preschool children occurs not only in specially organized pedagogical processes but also in the environment in which they live and study, in the interpersonal relations among members of the educational institution's staff, and in the educational environment emerging from these interactions. Moreover, the personal qualities, behavior, worldview, experience, knowledge, skills, and competencies of managerial staff and educators exert a specific influence on the development of children's personalities.

According to V.A. Slastenin and A.I. Mishenko, educators and learners, as subjects of the pedagogical process, are its main participants, and the pedagogical process is characterized as a specially organized process of interaction between educators and learners aimed at achieving educational objectives [7].

Based on these considerations, it can be stated that the classes organized in preschool educational institutions, more precisely the processes of education and upbringing and educational relations, constitute an integral pedagogical system. All forms of activities influencing children's personalities (walks, excursions, spiritual and educational events, sports competitions, fairs, etc.) and the processes of educational relations are interconnected and interdependent, possessing characteristics of mutual influence. The interrelation, interdependence, and unity of these constituent components express the integrity of the pedagogical process.

According to V.V. Sergeyev, to ensure effectiveness it is necessary to apply various methods and techniques, implement objective control and analyze its results, correct errors in a timely manner, and meet the requirements related to the competence of the inspector [6]. The form of internal control is directly reflected in the Three-Year перспективе Plan and the coordinated monthly plan (Work Journal) of the director of a state preschool educational institution [1]. In analyzing the current state of ensuring the quality and effectiveness of education in the activities of heads of preschool educational institutions, foreign experience can also be utilized. In Western literature, the term "improvement of structure" is generally not used. Instead, the following expressions are applied:

- making changes to the structure;
- replacing the structure;
- selecting the structure;
- integrating the structure.

Making changes to and replacing the structure is a continuous process in world practice and is considered one of the main indicators of managerial activity in any organization. The main factors of such changes are scientific and technological progress and strong competition. In U.S. companies, as well as in Western European and developed Eastern countries, management structures are on average replaced every 3–5 years.

Ways to improve the management structure:

1. Method of simplifying the existing structure. Reducing the number of management levels and granting more rights and authority to lower levels of management (decentralization). This method is considered among revolutionary approaches. Reducing the number of staff units or employees within them, transitioning from a matrix structure to a linear-functional structure, and ensuring that instead of one manager per 3–7 employees, there is one manager per 10–12 employees, that is, striving to achieve an optimal management norm.

2. Replacing a mechanically organized structure with an adaptive structure. A mechanically organized structure is characterized by the following negative aspects: rigidity in horizontal differentiation, strict hierarchical relations, standardized responsibility, a high degree of formalization, excessive centralization in decision-making, and the limited participation of most managers in this process, etc.

CONCLUSION AND RECOMMENDATIONS

The reforms being implemented in the preschool education system of our country place the issue of ensuring the effectiveness of preschool education processes by managerial staff of preschool educational institutions on the agenda as an urgent task.

It is known that the effectiveness of preschool education processes is characterized by ensuring the formation of a healthy and well-developed personality of the child, awakening interest in learning, and preparing for systematic education. Therefore, on the basis of structural management of preschool education, it is of great importance to further strengthen the functioning

of this system, create a comprehensively favorable developmental educational environment and conditions in preschool educational institutions, and increase the coverage of preschool-age children.

Structural management expresses the interrelation between bodies and systems responsible for solving specific tasks within a preschool educational institution. The goals, functions, tasks, objects, and bodies of managing a preschool educational institution determine its organizational structure. The more perfect the management structure, the more effectively influence on the process of preschool education and upbringing is exercised.

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HISTORICAL AND PEDAGOGICAL FOUNDATIONS OF THE FORMATION OF READING CULTURE IN FAMILIES

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Abstract. *In society, the book serves as a means of social communication. Analyzing the historical foundations of the processes related to the use, preservation, and organization of reading, as well as their consistent continuation in modern practice, and drawing scientific conclusions based on this analysis is considered one of the pressing issues of today. The work carried out in this area represents a significant step in matters of child upbringing within the family and strengthening family unity. This article scientifically substantiates the impact of family reading on the family environment by analyzing the scholarly views of our historical thinkers alongside the scientific conclusions of contemporary educators. Based on scientific analysis, conclusions, proposals, and recommendations aimed at developing family reading culture have been formulated.*

Keywords*: family, community (mahalla), pedagogy, reading, book, readership, parents, child, reading culture, scholar, family reading, society.*

Introduction

In the historical development of New Uzbekistan, books and their dissemination through information-library systems and librarianship constitute an integral part of human culture. Throughout the processes of cultural and historical continuity, books and libraries serve as unparalleled tools for maintaining connections among people, linking the present with the past and future, and acting as a vital link in the spiritual connection between generations and ancestors. As a means of social communication in society, information-library institutions, which organize the storage and reading of books, play a significant role in educating students, developing their thinking, enhancing IQ levels, guiding them toward professional activities, and helping them mature into independent individuals. Due to advances in science and technology, the volume of information is increasing day by day. As a result, new responsibilities are being placed on library professionals. One of these responsibilities is to provide fast and comprehensive information to consumers-school students, teaching staff, and the general public-through information technologies.

Information culture is a broad concept that has been defined differently by various scholars. In particular, A. Ibragimov describes information culture as the skill to effectively use all available information tools in everyday life and professional activities. Modern computer technologies greatly assist users in providing, analyzing, teaching, and reprocessing information, and in the future, they will play an essential role in developing highly skilled and competent specialists. The Decree of the President of the Republic of Uzbekistan dated January 15, 2026, No. PQ-9, "On measures to develop reading culture and promote interest in reading among the population," elevates the establishment of a "Reading Society" to the level of State policy and recognizes it as

one of the most important tasks in the information age. The decree sets the goal of raising the average annual number of books read per person to 10 between 2026 and 2030.

Furthermore, the Presidential Order dated January 12, 2017, on "Establishing a Commission to develop the system of publishing and distributing books, promote reading, and improve reading culture" is significant as it aimed to comprehensively address the challenges in this area. A special working group developed a comprehensive program of measures to improve book publishing and distribution, promote reading, and enhance reading culture. Subsequently, Presidential Decree No. 3271 was adopted in September of the same year. This process emphasizes popularizing reading, introducing children and youth to books, encouraging reading in the country's libraries, developing book readership and book trade, preparing and enhancing the qualifications of personnel in the field, improving the system, and monitoring reading habits.

The emergence of the book is directly linked to the advent of writing. Indeed, after humanity discovered writing, people sought to record their thoughts and, ultimately, to share their life experiences and principles with others, as well as to compare their ideas with those of others. Unsurprisingly, these tendencies contributed to the miracle of the book's creation. In ancient Egypt, Greece, and Central Asia, people initially recorded their thoughts on materials such as stone, palm leaves, and similar media. Historical evidence shows that after ideas and thoughts began to be written on papyrus, scroll books started to appear. People even inscribed their reflections on clay, though these early writings were quite heavy.

As human thinking and standards of living developed, the "weight" of books began to decrease-both literally and figuratively-because a characteristic feature of humanity is the continual pursuit of perfection, refinement, and convenience. "The peoples of Turan adopted the advanced achievements of Ancient Asia, Greece, Egypt, India, and other regions in writing and librarianship. This, in turn, led to the copying of books in manuscript form and the establishment of libraries in Central Asia."

Although many rare books were preserved in Central Asia, the destruction of libraries by invaders led to a significant cultural decline. Books are essential for valuing faith, understanding one's identity, and recognizing the Truth. For this reason, today in our country, great efforts have been made to publish and distribute religious and educational books, as well as the guidance works of our great scholars. This process has been carried out consistently, including the establishment of specialized publishing houses and limited liability companies dedicated to religious literature.

The works of eminent scholars and spiritual leaders such as Imam Bukhari, Termeziy, Rumi, and Yassavi-including guidance books, collections of hadith commentaries, and other writings-now fill the shelves of bookstores. Gratitude for these achievements is certainly deserved. By consulting these books, we can find detailed, well-supported answers to questions about the true nature of Islam, its purpose, and its history. These books serve as a guiding light in the darkness. Through their study, we can avoid superstition, heretical practices, and sinful actions. Additionally, reading these authentic and reliable works helps us understand sacred concepts such as parents, homeland, and nation. For these reasons, the importance of such educational works is immense.

The discovery of paper not only made book production more convenient but also fostered the art of decoration and binding. Calligraphy and bookbinding flourished in the Middle Ages. We know from history notable calligraphers such as Sultan Ali Mashhadi. Many rare manuscripts copied by Sultan Ali Mashhadi have survived to our time. Enhancing ink with fragrances and rose water, or writing with gold ink, made books aesthetically pleasing as well as meaningful.

In the palaces of enlightened rulers, special scribes and calligraphers worked, creating vast libraries filled with rare books. A remarkable tradition of presenting books as gifts emerged among kings and sultans, with books being regarded as the finest presents. For example, historical sources report that one of the sultans gifted Mirzo Ulughbek with several volumes of works by Khusraw Dehlavi. When Prince Abdullatif received news of the approaching caravan and hastened to intercept it, he opened the chests only to discover, not the rare gold and jewels he had expected, but a chest full of thick books.

This issue has been interpreted in the context of folk pedagogy, Islamic literature, and the teachings of great thinkers, emphasizing intellectual development and the pursuit of knowledge. The educational and moral views of scholars such as Abu Nasr al-Farabi, Abu Rayhan al-Biruni, Muhammad ibn Musa al-Khwarizmi, Abu Ali ibn Sina, Mahmudkhoja Behbudi, Yusuf Khass Hajib, Kaykavus, Ahmad Yugnaki, Abdurahman Jami, Alisher Navoi, Husayn Voiz Kashifi, Zahiriddin Muhammad Babur, and later Abdulla Avloni and Abdurauf Fitrat clearly demonstrate the role of books in learning and acquiring knowledge.

Abu Rayhan al-Biruni emphasized that human character is primarily formed within the family environment. The scholar advises parents to maintain a balanced approach to their child's psychological state. He also encourages parents to provide children with what is desirable and beneficial for them while keeping them away from things that may be harmful. According to al-Biruni, parents' consistent and uniform behavior toward a child is crucial for proper upbringing. Conversely, inconsistent treatment can create conditions for the development of negative traits in the child's character.

Al-Biruni links human moral qualities and ethical concepts directly to human nature, which is first shaped within the family. Therefore, the influence of parents and their exemplary behavior is of paramount importance in child-rearing. For instance, he advises women through the words of Abdulla ibn Jafar: "Avoid jealousy, for it is the key to divorce. I forbid you from frequently reprimanding your husband, as it breeds hatred. Maintain your appearance, using suitable means. Also, make use of pleasant scents; the best among them is water." These instructions are directly related to raising children within the family. Al-Biruni also addresses physical and spiritual purity. Where cleanliness, order, and hygiene exist in the household, spiritual purity will also be present. This concept goes beyond maintaining a clean body; it encourages active engagement and effort, which is associated with labor and productivity. His ideas on the unity of the body and soul's purity reflect the connection between physical health and moral-spiritual development, aligning with contemporary understanding of balanced child upbringing.

He further notes that inconsistent parental behavior leads to varied traits in children. Al-Biruni scientifically argued that balanced child behavior ensures both physical and mental well-being. He emphasized that in child development, heredity, environment, and upbringing are equally important. Al-Biruni approached moral education based on the principles of Islam, viewing morality as emerging and developing from the struggle between good and evil. His perspective was both innovative and scientifically prophetic for his time.

Muhammad ibn Musa al-Khwarizmi, in his works, divided parents into two categories: the biological father, responsible for the child's physical creation and growth, and the educational (spiritual) father, responsible for the child's full moral and intellectual development. He emphasized that considering both roles in unity is crucial for effective upbringing. His following words are particularly instructive: "I have seen no teacher better than the times and no student better than the human being." From this statement, we understand, on one hand, the decisive

influence of the social environment on child-rearing, and on the other hand, that a human being can achieve perfection through proper education. The issue of the family and child-rearing within the family occupies an important place in the scholarly legacy of Abu Ali Ibn Sina. In his numerous works, he writes extensively about the child's health, upbringing, and, most importantly, the study of the child's psychological development. His insights form a coherent system of pedagogical views aimed at shaping a morally and spiritually well-rounded individual. In Ibn Sina's work *Tadbiri al-manozil*, a large chapter is devoted specifically to the family and issues of family education.

From the views of the aforementioned scholars, philosophers, psychologists, pedagogues, philologists, and literary scholars, it is clear that the family is considered a sacred institution. They emphasize the need to cultivate reading habits within the family as a means to elevate its moral values and advance its cultural development. These scholars concluded that "books remain dead until they are revived through the individuality of the reader. Each new reader discovers a new text within the same work.". The study of reading culture and the development of family reading habits in Uzbekistan during the years of independence has expanded opportunities to analyze how contemporary pedagogy can be shaped. This is based on the research of numerous philologists, pedagogues, psychologists, and historians, who have highlighted the importance of reading, as well as how family literacy contributes to the spiritual and cultural wealth of the household.

O.A.Turakulova analyzed technologies for forming and developing reading culture in students through literature lessons, including methodological and pedagogical-psychological approaches, classroom and extracurricular activities, and the effectiveness of project-based learning. K.A.Abdulvahidov, in his scholarly articles, explores the social and philosophical foundations of reading culture. Sayyora Chiniyeva, in her publications, provides analytical conclusions on how reading together with children in the family and cultivating a reading culture enhances their intellectual abilities, worldview, and spiritual maturity.

Reading and discussing books together in a family environment fosters the development of thought and requires active participation from both parents. These studies emphasize the social and pedagogical significance of cultivating a culture of reading within the family. D. Davronova notes that "by fostering the social awareness of minors within the family and contributing to the development of the 'Family-Neighborhood-Educational Institution' cooperation system, it is possible to advance the educational framework and address issues of family upbringing through enhancing children's social consciousness.". She pays particular attention to this issue and, drawing on the views and research of foreign scholars on the development of social awareness, highlights the advantages of establishing cooperation between the family, neighborhood, and educational institutions. Research by both local and international scholars shows that it is unfortunate when parents in today's families consider fostering children's interest in books and reading solely the responsibility of the teacher.

Conclusion

In conclusion, we present a number of recommendations for promoting a culture of reading within families:

A variety of methods can be used to develop and cultivate reading skills in children. To foster interest and motivation in reading, it is recommended to organize book festivals, engaging meetings with children who have achieved high results in reading, and local young poets, as well as use inspiring video clips and stories.

Roundtable discussions, analysis of famous works, question-and-answer reading sessions, and thinking exercises in a training format help children develop skills in understanding and analyzing texts. In the family setting, real reading activities can be organized through keeping a book diary, small theatrical performances, discussion evenings, and book fairs.

To engage children through community collaboration, organizing trips to the local Cultural and Leisure Center positively impacts them. A library that is cozy, bright, and has a pleasant and calm atmosphere is appealing to children. Introducing the environment of books by library staff sparks curiosity and interest. Non-traditional exhibitions in the library allow children to interact freely with books. Organizing a "Describe My Favorite Book" activity encourages children to name and describe the books they enjoy. This process develops the child's ability to classify books, construct small sentences based on the content, creatively describe, make conscious choices, analyze the selected work briefly, think independently, and develop communication skills while sharing their descriptions, making the activity more meaningful. At the conclusion, active participants were awarded certificates.

Children develop cognitive skills, critical thinking, teamwork, and communication abilities.

Meetings titled "My Reading Peer" in neighborhoods, where children who have achieved success in local reading activities are invited, generate great interest not only among children but also among parents. Organizing reading competitions at the district or city level, recognizing the winners, and involving the "hero" of the event creates a strong impression on peers. Young participants who achieve success through reading are warmly welcomed at their schools and among their peers. Their experiences emphasize the importance of effort, self-confidence, and support from parents and relatives, inspiring other children in the community to become avid readers.

Short video clips showcasing children who have achieved high results in national competitions stimulate interest, enthusiasm, and aspirations for achievement among children, while also motivating parents. Parents, understanding that responsibility and initiative are essential for their child's success, realize the importance of being role models and actively promoting family reading habits.

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THE EFFECTIVENESS OF FLIPPED CLASSROOM IN INTERACTIVE ENGLISH LANGUAGE TEACHING

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Abstract. *The flipped classroom (FC) approach has emerged as a transformative pedagogical model in English language teaching (ELT), reorganising instructional content delivery outside the classroom while dedicating in-class time to interactive, communicative, and collaborative activities. This paper critically synthesises empirical research on FC effectiveness, highlighting improvements in language skills, learner engagement, and self-regulated learning. In addition, it proposes a hypothetical quasi-experimental study to examine FC's impact on listening, speaking, and communicative competence in interactive English classrooms.*

Keywords*: flipped classroom, English language teaching, Interactive learning, Learner engagement, Pedagogy, Self-regulated learning*

Introduction

The flipped classroom (FC) has emerged as an innovative pedagogical approach that restructures traditional teaching by transferring the initial stage of knowledge acquisition outside the classroom while reserving classroom time for interactive and collaborative learning activities. In this model, students engage with instructional materials such as video lectures, digital readings, and online modules before attending class, which allows in-class sessions to focus on discussion, problem-solving, and communicative practice. The concept gained significant attention after its implementation by Jonathan Bergmann and Aaron Sams in secondary science education, where they demonstrated that pre-class exposure to content could enhance classroom interaction and student engagement.

From a theoretical perspective, the flipped classroom is closely associated with constructivist learning theory, which emphasises the active role of learners in constructing knowledge through meaningful interaction. Educational theorists such as Jean Piaget and Lev Vygotsky argue that learning becomes more effective when students participate actively in collaborative tasks and social interaction. In the context of English Language Teaching (ELT), the FC model aligns well with the principles of Communicative Language Teaching and task-based learning, which prioritise authentic communication and learner-centred classroom practices. As noted by Jeremy Harmer and David Nunan, language learning is significantly enhanced when learners are provided with opportunities to practise language through meaningful communication and cooperative activities.

Recent empirical studies indicate that flipped learning environments contribute to improved learner autonomy, increased motivation, and greater engagement in language learning tasks. In addition, digital learning platforms such as Moodle, Google Classroom, and YouTube have made it easier for educators to implement flipped instructional models by providing accessible online learning resources. These technological tools support flexible learning

environments where students can review instructional content at their own pace while using classroom time for interactive language practice.

The present paper aims to examine the effectiveness of the flipped classroom approach in English language teaching by providing a critical review of existing literature, proposing a hypothetical research framework to evaluate its impact on students' language proficiency, and offering pedagogical recommendations for effective implementation in higher education contexts.

The FC approach integrates constructivist learning theory and Bloom's Taxonomy, enhanced by contemporary pedagogical models.

Constructivism: Learners actively construct knowledge through interaction, reflection, and application (Mohammadi, Barati, & Youhanaee, 2025). Vygotsky (1978) emphasised that social interaction and scaffolding are essential for cognitive development, aligning with FC in-class collaborative activities.

Bloom's Taxonomy: Pre-class materials address lower-order cognitive skills (knowledge, comprehension), whereas in-class activities target higher-order skills (application, analysis, evaluation) (Wei, 2025). For example, grammar rules can be introduced via pre-class videos, and role-play exercises allow learners to apply and analyse these structures in real-world contexts.

Experiential learning: Kolb's (1984) cycle of concrete experience, reflective observation, abstract conceptualisation, and active experimentation complements FC by linking pre-class learning with active in-class practice.

This theoretical integration enhances cognitive engagement, affective motivation, and the development of self-regulated learning skills, all crucial for effective language acquisition.

Meta-analytic findings

Meta-analyses of multiple empirical studies involving over 1,200 EFL learners indicate that the flipped classroom (FC) produces substantial gains in English language proficiency compared with traditional instructional methods. Standardised mean differences (SMD) reported across these studies range from 0.68 to 0.85 (ResearchGate, 2023; ScienceDirect, 2023), reflecting large and educationally meaningful effects. These improvements are evident in both receptive skills—listening and reading—and productive skills—speaking and writing—highlighting the comprehensive impact of FC on language learning.

For instance, Hung (2015) reported a 16% increase in listening comprehension and a 14% improvement in speaking fluency among high school EFL learners following an eight-week FC programme. Similarly, Lee and Park (2019) observed notable gains in writing performance and learner engagement, demonstrating that FC supports both linguistic development and active participation in communicative tasks.

These meta-analytic findings suggest that the flipped classroom model not only enhances measurable language skills but also promotes learner autonomy, intrinsic motivation, and the capacity to apply knowledge in authentic communicative contexts. The consistent positive outcomes across diverse studies underscore FC's efficacy as a pedagogical approach capable of fostering both cognitive and affective dimensions of language learning.

Engagement and motivation

The flipped classroom (FC) fosters behavioural, emotional, and social engagement by actively involving students in peer discussions, problem-solving activities, and reflective exercises. Empirical studies demonstrate measurable gains in learner engagement within FC settings. For example, Lee and Park (2019) reported that high school EFL students participating in an eight-week FC programme showed a 20% increase in self-regulated learning behaviours,

including planning, monitoring, and evaluation. Similarly, MDPI (2022) found significant improvements in student participation rates and active collaboration during in-class tasks compared to traditional instruction.

From a theoretical perspective, FC enhances engagement by aligning with Self-Determination Theory (Ryan & Deci, 2000), which emphasises autonomy, competence, and relatedness as key drivers of intrinsic motivation. Pre-class materials provide learners with autonomy and control over the pace and order of learning, while in-class collaborative tasks promote social interaction and competence development, thereby reinforcing both motivation and cognitive engagement. These findings suggest that the FC model not only increases observable classroom participation but also develops self-regulated learning skills, fostering learners' capacity to plan, monitor, and evaluate their own progress-an essential component of effective language acquisition and lifelong learning.

Cross-cultural and contextual considerations

Research indicates that cultural attitudes towards collaborative learning, teacher authority, and peer interaction significantly influence the implementation and effectiveness of the flipped classroom (FC) model (DergiPark, 2025). For instance, learners from cultures with traditionally teacher-centred approaches may initially struggle with autonomous pre-class learning and peer-led discussions. Conversely, students accustomed to collaborative and participatory learning environments often adapt more readily and benefit maximally from FC activities.

From a theoretical perspective, Hofstede's Cultural Dimensions (Hofstede, 2010) suggest that differences in power distance and individualism versus collectivism can shape learners' engagement and responsiveness in FC settings. High power-distance cultures may require gradual scaffolding to foster comfort with peer collaboration and decision-making, whereas low power-distance cultures may engage more naturally in interactive and self-directed tasks.

Successful implementation therefore, requires:

- Institutional support: Providing access to digital platforms, technological infrastructure, and administrative encouragement.
- Culturally appropriate scaffolding: Gradually introducing collaborative activities, clarifying expectations, and modelling peer interaction.
- Learner preparation: Offering guidance on pre-class materials, self-regulated learning strategies, and the purpose of interactive tasks.

By acknowledging these contextual and cultural factors, educators can adapt FC strategies to learners' needs, ensuring equitable engagement, motivation, and ultimately, improved language learning outcomes.

Research Design

A quasi-experimental design with an experimental and a control group was employed to evaluate the effectiveness of the flipped classroom (FC) approach in high school EFL contexts. This design was chosen due to practical constraints in school settings, such as pre-assigned classes and limited randomisation possibilities, while still allowing for comparative analysis of intervention effects (Creswell, 2014).

Participants

The study involved 60 high school EFL learners, aged 15–17 years, with proficiency levels ranging from A2 to B1 according to the CEFR. Participants were randomly assigned to:

Experimental group (n = 30) – received the FC intervention

Control group (n = 30) – received traditional teacher-led instruction

Additional participant characteristics, including gender, prior exposure to English instruction, and baseline motivation levels, were recorded to ensure comparability between groups.

Intervention

Experimental group: Engaged with pre-class materials, including video lectures, digital readings, and interactive online exercises. In-class sessions focused on role-plays, peer discussions, problem-solving tasks, and collaborative projects, designed to foster communicative competence and active learning.

Control group: Received traditional instruction, with in-class teacher-led explanations, grammar exercises, and guided practice activities.

Data collection. Multiple data sources were employed to evaluate the impact of FC on language proficiency, engagement, and motivation:

- Pre- and post-tests: Assessed listening, speaking, and grammar performance using standardised rubrics.
- Questionnaires: Measured learner motivation, self-efficacy, and engagement using validated Likert-scale items.
- Classroom observation: Structured observation of collaborative interactions, participation, and peer-to-peer communication quality.

Ethical considerations. Informed consent was obtained from students and parents. Participation was voluntary, with the option to withdraw at any stage. All data were anonymised, and the study adhered to institutional ethical guidelines for research involving minors.

Data analysis. Quantitative data were analysed using paired and independent t-tests to compare pre- and post-test performance between groups, with effect sizes reported (Cohen's d). Qualitative data from observations and open-ended questionnaire responses underwent thematic analysis to identify patterns in engagement, collaboration, and learner interaction.

Data analysis and practical considerations

Quantitative analysis. Data from pre- and post-tests were analysed using paired-sample t-tests to examine within-group improvements and independent-sample t-tests to compare experimental and control groups. Effect sizes (Cohen's d) were calculated to evaluate the practical significance of observed differences, providing robust evidence for the impact of the flipped classroom (FC) on language proficiency.

Qualitative analysis. Qualitative data, including structured classroom observation notes and open-ended student feedback, underwent thematic analysis to identify recurring patterns in learner engagement, collaboration, and self-regulated learning behaviours. Themes such as active participation, peer interaction, and reflective learning were highlighted, demonstrating the affective and social dimensions of FC implementation.

Learner preparedness. The effectiveness of FC relies heavily on the completion of pre-class materials. Students must engage with video lectures, readings, and online exercises before attending class to fully benefit from interactive in-class activities. To support preparedness, educators should implement scaffolding techniques, set clear expectations, and use accountability strategies such as pre-class quizzes or short reflective assignments.

Technology access. Reliable access to digital devices and stable internet connectivity is essential for FC success. Without these resources, learners may struggle to complete pre-class tasks, which can reduce participation and learning outcomes. Institutions should ensure technological infrastructure is adequate and accessible to all students.

Teacher workload. Developing pre-class videos, interactive exercises, and collaborative tasks is time-intensive and requires careful planning. Teachers may need institutional support, collaborative planning time, and professional development to design effective FC materials.

Contextual factors. Cultural norms, institutional policies, and learner expectations influence FC implementation. For example, in cultures with high respect for teacher authority, students may initially resist student-centred activities. Gradual introduction of collaborative tasks and culturally sensitive scaffolding are recommended to ensure engagement and participation.

Impact on learning. The FC model facilitates active learning, engagement, learner autonomy, and deeper cognitive processing. By combining structured pre-class content with interactive in-class activities, FC creates a student-centred learning environment conducive to language acquisition. Compared with traditional instruction, FC enables:

Real-time feedback from peers and teachers

Collaborative problem-solving and communication

Application of theory to practical language use

Conclusion and Practical recommendations

Train learners in self-regulated learning strategies, including planning, monitoring, and evaluating their own learning.

Provide teachers with professional development in digital pedagogy and interactive activity design.

Ensure adequate technological infrastructure in schools, including devices, internet access, and learning management platforms.

Future research directions

- Examine the long-term retention of language skills in FC environments.
- Investigate FC effectiveness among lower-proficiency learners.
- Explore the integration of mobile learning and AI-based adaptive systems to enhance personalisation and engagement.

Policy implications

- Schools should invest in digital infrastructure and teacher training to maximise FC benefits.
- Guidelines for culturally and contextually adapted FC implementation should be developed, ensuring inclusivity and responsiveness to diverse learner needs.

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IMPROVING THE METHODOLOGY OF TEACHING BIOCHEMISTRY IN HIGHER MEDICAL EDUCATION INSTITUTIONS BASED ON INNOVATIVE TECHNOLOGIES

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Abstract. *This article provides a theoretical analysis of the role of innovative technologies in improving the methodology for teaching Biochemistry in higher medical education. It examines digital learning platforms (Moodle, Google Classroom, Microsoft Teams), distance learning, virtual laboratories, simulation training, AR/VR technologies, gamification, interactive methods, and video lessons. The study is based on literature review including systematic reviews, scoping studies and UNESCO guidance.*

Keywords: *innovative technologies, biochemistry, digital learning, medical education, distance learning, simulation training, virtual laboratory, interactive method, gamification, AR/VR technology.*

Introduction

Biochemistry is one of the fundamental disciplines that form the theoretical basis of medical science. It explores molecular processes, homeostasis, and the mechanisms by which drugs affect the human body (Lehninger, 2021). In the training of modern medical professionals, not only theoretical knowledge but also practical competencies — such as laboratory skills, diagnostic reasoning, and clinical logic — play an essential role. To meet these requirements, the integration of innovative technologies into the educational process has become increasingly necessary (UNESCO, 2022).

The education system of the 21st century has entered a new stage in which digital technologies, artificial intelligence, and information and communication technologies have become an integral part of the learning environment. The decrees and resolutions of the President of the Republic of Uzbekistan aimed at the digitalization of education and the implementation of innovative technologies (for example, PQ–3775, PQ–2909) serve as key instruments for improving the quality of medical education.

Digital transformation tools — including AR/VR technologies, virtual laboratories, and simulation training — make it possible to visualize complex biochemical processes, conduct experiments in a safe environment, and encourage students' independent and collaborative learning (Gamage et al., 2022; Tene et al., 2024). Therefore, the purpose of this article is to analyze, on the basis of existing scientific literature, the pedagogical effectiveness of innovative technologies in teaching biochemistry and to develop methodological recommendations for their implementation.

Research methods: literature review, synthesis of systematic reviews and scoping studies, and theoretical-pedagogical analysis (Gamage et al., 2022; Jiang et al., 2022).

Literature Review and Theoretical Foundations:

The modern educational paradigm is based on learner-centered, outcome-oriented, and competency-based approaches. Within pedagogical theory, innovative technologies are regarded as tools that ensure the interactivity, individuality, and reflective analysis of the educational process (Anderson, 2020; UNESCO, 2022).

The role of biochemistry in medical education is unique: it is closely interconnected with such disciplines as physiology, pharmacology, pathological anatomy, and molecular biology. Therefore, the methodology for teaching this subject must rely on interdisciplinary integration (Lehninger, 2021). Traditional forms of teaching — such as lectures, laboratory work, and seminars — are now considered insufficient for developing students' independent thinking, problem-solving abilities, and creative approaches. Innovative technologies, on the other hand, introduce new opportunities into this process. In particular, digital learning tools, simulation environments, virtual experiments, and gamification allow students to develop practical skills in a safe setting, visualize complex biochemical processes, and model experimental scenarios effectively (Berg et al., 2019).

Digital learning resources and Learning Management Systems (LMS) — such as Moodle and Google Classroom — represent a new architecture of education. Through LMS, instructors can manage educational content, automate assessment and feedback, and monitor the individual progress of students (Gamage et al., 2022). In STEM disciplines, including biochemistry, research has demonstrated that using Moodle to host interactive tests, assignments, and laboratory instructions is an effective pedagogical strategy (Gamage et al., 2022). According to UNESCO's recommendations on digital education, the implementation of online learning systems should take into account inclusivity, teacher retraining, and infrastructural constraints (UNESCO, 2022). From this perspective, in the context of Uzbekistan, before the wide introduction of LMS platforms, it is essential to strengthen pedagogical design frameworks and technical support systems to ensure the sustainability of digital learning.

Distance Learning Technologies. During the pandemic period, distance learning became an integral part of medical education. Online lectures delivered through platforms such as Zoom and Microsoft Teams enabled the visualization of biochemical processes and facilitated the explanation of complex mechanisms through animations and interactive presentations. Distance learning is important not only in emergency situations but also as a tool for diversifying the educational process. It broadens access to knowledge regardless of students' geographical location, allows for more efficient use of resources, and accelerates information exchange (UNESCO, 2022).

Virtual Laboratories and Simulations. In medical education, it is not always possible to conduct laboratory experiments under fully realistic conditions. Therefore, virtual laboratories are increasingly being adopted as effective alternatives in teaching biochemistry. These laboratories provide students with opportunities to conduct experiments safely, learn from mistakes, and explore a wider range of experimental parameters. For example, platforms such as Labster and PhET Interactive Simulations enable students to investigate enzyme kinetics, metabolic pathways, pH effects, and substrate concentration in an online environment. These technologies help students develop analytical thinking, observational abilities, and experimental analysis skills (Caspersen & O'Connor, 2020).

Empirical studies on Labster and similar platforms show that virtual laboratories have a positive impact on consolidating theoretical knowledge and enhancing laboratory competencies (Carroll et al., 2024; Labster Evidence). The effectiveness of virtual laboratories reaches its highest

level when combined with traditional hands-on experiments — that is, when applied within a blended learning model (Carroll et al., 2024).

Simulation Training. Simulation training plays a crucial role in medical education. In the field of biochemistry, such training is particularly valuable for modeling clinical conditions — for example, diabetes, hypothermia, or intoxication — and demonstrating the corresponding physiological and biochemical changes to students in an understandable and interactive way. Through simulation, learners can connect theoretical biochemical mechanisms with real-life clinical manifestations, thereby strengthening diagnostic reasoning and practical understanding.

AR/VR Technologies. Augmented Reality (AR) and Virtual Reality (VR) technologies represent some of the most advanced tools in teaching biochemistry. These technologies allow students to analyze molecules, cellular organelles, and enzyme–substrate complexes in a three-dimensional (3D) format. By providing information in a spatial and visual context, AR and VR enable students to explore molecular structures, metabolic cycles, and cellular architecture more deeply.

Applications such as Human Anatomy VR and Biochemistry 3D Lab allow students to visualize ATP synthesis, the Krebs cycle, and the electron transport chain in immersive environments. This approach enhances visual memory retention and provides a learning effect comparable to traditional laboratory experiences (Moussa, 2021). Studies by Tene et al. (2024) and Jiang et al. (2022) confirm that AR/VR technologies significantly improve both clinical and theoretical competencies in medical education. They strengthen students' visual memory and logical associations, although their implementation requires substantial financial and technical resources (Tene et al., 2024).

Gamification and Interactive Methods. Gamification, defined as the integration of game elements into the learning process, increases student motivation, encourages engagement, and facilitates faster consolidation of knowledge (Huang, 2024; Wang, 2024). In medical education, gamification is increasingly used to enhance clinical skills, improve decision-making speed, and foster teamwork among students. Interactive methods such as case-based learning, problem-based learning, and role-play contribute to the integration of biochemical knowledge into clinical contexts (Anderson, 2020). These approaches promote active learning, critical thinking, and the ability to connect biochemical mechanisms with clinical outcomes.

Additionally, active learning techniques such as "brainstorming," "debate," "cluster method," "problem situation," and "role-playing" make the study of biochemistry more engaging and participatory. They help students develop analytical reasoning, express their ideas confidently, and cultivate academic communication skills essential for future medical professionals. Video lessons and animated visualizations also help to understand biochemical processes (for example, glycolysis, the Krebs cycle, and transamination) more clearly. Short micro-lessons (lasting 5–10 minutes) prepared by the instructor improve students' concentration and increase the efficiency of retaining the main idea (UNESCO, 2022).

Using information from the literature, we can say the following about the pedagogical significance of innovative approaches: the introduction of innovative technologies in higher medical education institutions has a complex effect on the quality of mastering the subject of biochemistry:

– Develops students' critical and systematic thinking skills;
– Strengthens interdisciplinary connections (biochemistry – physiology – pharmacology);
– Makes the teaching process more visual, interactive, and reflective;

– Allows organizing the learning process in a student-centered manner;

– Enables the management of the teacher's activity based on monitoring and analysis.

These factors show that innovative approaches in teaching biochemistry significantly increase not only the quality of education but also the practical training level of medical specialists. The analysis of the literature shows that innovative technologies can play an important role in biochemistry education, but their effectiveness mainly depends on pedagogical design and integration (Gamage et al., 2022; Carroll et al., 2024). Virtual laboratories and AR/VR technologies strengthen students' visual-mechanistic understanding, but they do not completely replace traditional laboratory classes; the best results are observed in the blended learning model (Carroll et al., 2024). Gamification increases motivation, but additional empirical research is needed to determine how it affects long-term learning and the formation of deep understanding (Huang, 2024; Wang, 2024). In addition, taking into account the costs and technical maintenance requirements of AR/VR and virtual laboratories, resources should be planned systematically (Tene et al., 2024). In the conditions of Uzbekistan, important factors for introducing innovative technologies include teachers' qualifications, educational infrastructure, and financial capabilities. UNESCO recommendations emphasize the need to ensure infrastructure and inclusivity — this also requires the development of strategies adapted to local conditions (UNESCO, 2022).

Below are recommendations for implementing innovative technologies in teaching biochemistry. The recommendations are based on literature reviews and international practice.

1. LMS and Content Design. Clear learning outcomes should be defined for each module, and content corresponding to the module structure should be created in Moodle or Google Classroom (Gamage et al., 2022).

Interactive tests and formative assessments (quizzes, self-assessment) should be used to continuously monitor students' learning progress.

Video micro-lessons (5–10 minutes) and animations should be used to reinforce the main theoretical blocks (UNESCO, 2022).

2. Integration of Virtual Laboratories and Simulations. Virtual laboratories should be introduced as a preparatory part of the laboratory course: first, students perform experiments in a virtual environment, make mistakes, and analyze results, and then conduct real experiments in the laboratory (Carroll et al., 2024).

Using simulated clinical situations should help students develop the skills to interpret biochemical results in a clinical context (Jiang et al., 2022).

3. Targeted Use of AR/VR. AR/VR resources should be applied to explain complex structures and processes (mitochondria, the electron-transport chain, molecular complexes). A cost-benefit analysis should be carried out when selecting resources (Tene et al., 2024).

AR/VR modules should be introduced as supplementary tools for laboratory classes conducted in small groups.

4. Gamification and Interactive Teaching Strategies. On platforms such as Kahoot or Quizizz, quizzes and professional tasks corresponding to the topic should be developed; scoring systems and leaderboards should be designed to increase motivation (Huang, 2024).

Case-based learning and problem-based learning methods should serve as the main tools for linking biochemistry topics with clinical situations.

5. Teacher Retraining and Infrastructure. Elective courses on digital pedagogy and technological design should be organized; a certification system for teachers should be introduced (UNESCO, 2022).

University infrastructure — including high-speed Internet, laboratory stations, AR/VR devices, and technical support services — should be ensured.

Conclusion. Innovative technologies such as LMS platforms, virtual laboratories, AR/VR, gamification, and simulations are effective tools for consolidating students' knowledge and developing practical skills in biochemistry (Gamage et al., 2022; Carroll et al., 2024). The most effective model is blended learning: virtual laboratories and AR/VR are used at the theoretical and preparatory stages, while real laboratories serve for verifying practical skills (Carroll et al., 2024). The integration and content design of digital platforms (Moodle, Google Classroom, Teams) determine the effectiveness of teaching; therefore, retraining teachers in digital pedagogy is necessary (Gamage et al., 2022; UNESCO, 2022). Gamification and interactive methods increase students' motivation, but methodological approaches are required to link them directly to learning outcomes (Huang, 2024). When introducing innovative technologies, financial and technical capacities as well as inclusive approaches (equal opportunities for all students) must be considered (UNESCO, 2022). It is recommended that medical higher-education institutions in Uzbekistan introduce blended-learning models through pilot projects, organize practical training for instructors, and gradually integrate AR/VR and virtual laboratories into educational content.

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THE CONCEPTUAL ESSENCE OF COGNITIVE ACTIVITY AND ITS PSYCHOLOGICAL-PEDAGOGICAL FOUNDATIONS

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Abstract. *This article analyzes the main factors influencing students' cognitive activity in the educational process. The study reveals the impact of motivation, the psychological environment, the teacher's pedagogical approach, and methodological tools on the development of cognitive activity. The practical application of interactive teaching methods such as brainstorming, concept mapping, debates, clustering, and case analysis is also examined. The research is based on modern pedagogical approaches and aims to develop students' independent thinking, reasoning, and problem-solving skills. The findings highlight the importance of organizing the educational environment in a way that stimulates cognitive development and encourages active learning.*

Keywords: *cognitive development, interactive methods, educational process, thinking, cognitive activity, motivation, independent learning, teacher's role, case analysis, debate, metacognitive skills, learning environment, facilitator.*

Introduction

Cognitive development is the process of forming a learner's ability to acquire knowledge, retain information, solve problems, think logically, and make decisions. In the modern knowledge-based economy, cognitive competencies are considered essential for successful socialization and professional development. Therefore, identifying the factors that stimulate cognitive development and determining effective pedagogical methods for enhancing cognitive activity has become an important task in contemporary education.

In the 21st century, human capital, intellectual potential, and digital knowledge are recognized as key drivers of social development. Under these conditions, the main task of the education system is to ensure the comprehensive development of an individual's intellectual and cognitive abilities. The systematic formation and development of cognitive activity, which represents the highest level of human thinking, has become a significant area of research in modern pedagogy.

The Decree of the President of the Republic of Uzbekistan dated October 8, 2019 (PF-5847) "On approving the Concept for the Development of the Higher Education System until 2030" emphasizes the importance of introducing international educational standards, improving the quality of the learning process, and gradually shifting from a purely theoretical model of education to a system focused on developing practical skills.

In addition, the Law of the Republic of Uzbekistan "On Education" highlights the principle of continuity in education, which refers to the interconnected and logically consistent sequence of educational processes aimed at meeting individuals' lifelong learning needs. Within the framework of continuous education, strengthening the integration of education, science, and production is considered one of the priority tasks.

Recent reforms in the education system also emphasize the development of cognitive, social, emotional, and physical competencies. The Resolution of the Cabinet of Ministers (No.157, March 27, 2024) on improving the procedures for developing and implementing state educational standards stresses the importance of developing learners' cognitive abilities as a key component of educational quality.

Despite these reforms, the existing pedagogical practice still lacks methodological consistency in developing students' cognitive abilities. As a result, students' skills in logical reasoning, problem-solving, attention, and memory development may remain insufficient. Therefore, improving pedagogical methods aimed at developing cognitive activity based on the principles of continuity and consistency remains a relevant scientific problem.

Methodology

The research is based on theoretical analysis of psychological and pedagogical literature, comparative analysis of scientific approaches to cognitive activity, and generalization of modern pedagogical practices. The study examined scientific works devoted to the development of cognitive activity, including the research of scholars such as I.A. Zimnaya, I.I. Ilyasov, I. Lingart, and D.B. Elkonin. In addition, the theoretical foundations of cognitive development proposed by modern educational psychologists were analyzed. The research also considered interactive teaching methods widely used in modern pedagogy, including:

- brainstorming
- concept mapping
- debate
- clustering
- case-study analysis

These methods were analyzed in terms of their role in activating students' cognitive processes and enhancing independent thinking skills.

Results

The analysis shows that cognitive activity represents a complex mental process that includes perception, attention, memory, thinking, imagination, and speech. Cognitive activity can be defined as the ability of individuals to perceive, process, store, and apply information. It ensures the development of intellectual abilities such as analytical thinking, critical reasoning, and creative problem solving. According to psychological studies, cognitive activity possesses several important characteristics:

1. It is primarily aimed at mastering educational material and solving learning problems.
2. It involves the acquisition of generalized methods of knowledge and actions.
3. It integrates several types of mental and practical activities such as perception, memorization, analysis, comparison, classification, and practical problem solving.
4. It influences the development of learners' individual psychological traits including character, abilities, thinking, memory, emotions, and behavior.
5. It contributes to the individual's self-development and intellectual growth.

D.B. Elkonin also emphasizes that learning activity has a social nature. It involves the assimilation of scientific, cultural, and spiritual achievements of humanity and is organized within formal educational institutions such as schools, colleges, and universities. The research also highlights the importance of learning motivation. Students' internal interest and curiosity significantly enhance cognitive activity and improve learning outcomes. Furthermore, the use of

interactive teaching methods stimulates active participation in the learning process. Such methods encourage students to analyze information, express their opinions, and collaborate in solving complex problems.

Discussion. Modern pedagogical research emphasizes that the development of cognitive activity depends not only on teaching content but also on the organization of the learning environment. Scholars such as E.I. Mashbits argue that managing learning activity involves activating internal cognitive mechanisms rather than simply organizing external instruction. According to his theory, students' ability to plan, monitor, and evaluate their own learning process plays a crucial role in cognitive development.

Similarly, L.M. Fridman states that cognitive activity can be effectively stimulated through problem-based learning. When students are placed in situations that require independent thinking and investigation, they become more motivated to seek knowledge. Another important factor influencing cognitive activity is the use of information technologies in education. Digital tools encourage analytical thinking, algorithmic reasoning, and problem-solving skills, which are essential competencies in the modern knowledge society. Therefore, the integration of interactive teaching methods, problem-based learning, and digital technologies can significantly improve the effectiveness of cognitive development in the educational process.

Conclusion

The analysis of psychological and pedagogical literature demonstrates that cognitive activity plays a crucial role in the intellectual development of learners. The effective organization of the educational process requires the identification of factors that stimulate cognitive development and the implementation of appropriate pedagogical methods. The study shows that motivation, a supportive psychological environment, the teacher's pedagogical approach, and the use of interactive teaching methods significantly influence students' cognitive activity.

Applying interactive learning strategies such as brainstorming, debate, concept mapping, clustering, and case analysis promotes independent thinking, logical reasoning, and problem-solving skills. These methods create opportunities for students to actively participate in the learning process and develop higher-order cognitive abilities. Therefore, educators should organize the learning environment in a way that supports cognitive development and encourages active engagement in the learning process. Improving teaching methodologies based on the principles of continuity and consistency will enhance the quality of education and contribute to the development of competent and creative specialists.

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APPLICATION OF EDUCATIONAL METHODS IN TEACHING BIOLOGICAL SCIENCES

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Abstract. *This article describes the integration of biology and pedagogical sciences, the concept of method, teaching methods used in teaching biological disciplines, oral, demonstrative, and practical types.*

Keywords: *methods, integration, lecture, conversation, demonstration methods, working with books, practical methods.*

INTRODUCTION

Method (from the Greek methodos - "study", "study") - a set of ways, methods, techniques and procedures used to achieve a specific goal, study phenomena or solve a problem. It is a systematic means of applying theoretical knowledge to practice, collecting and analyzing facts. Along with determining the scope of the content of the subject and selecting materials for the lesson, the selection of teaching methods is also of great importance in school education. The word method in a general sense is a way to achieve a specific goal, an activity regulated in a certain way. The teaching method is the way in which the teacher imparts knowledge and at the same time the way in which it is acquired by the students. This definition of the method represents its two interrelated sides: the knowledge-giving, influencing-teacher and the receiving! assimilating students. The nature of this interaction depends on the source of knowledge.

LITERATURE REVIEW

The issue of effective biology teaching is one of the important scientific directions in the field of pedagogy and methodology. In the modern education system, the use of various pedagogical methods in teaching biology is of great importance in deepening students' knowledge, developing their scientific thinking, and forming practical skills. In pedagogy, teaching methods are considered one of the main factors that increase the effectiveness of the educational process. Scientists I.Ya.Lerner and M.N.Skatkin interpreted teaching methods as methods of organizing students' cognitive activity and divided them into such types as explanatory, problem-based learning, research method, and heuristic method. In their opinion, it is necessary to widely use problem-based learning and research methods to develop students' independent thinking.

The effectiveness of educational methods is also widely covered in scientific works on the methodology of teaching biology. In particular, V.V.Pasechnik emphasizes the importance of forming a scientific worldview in students through observation, experiments, laboratory work and practical exercises in biology lessons. It is also noted that experimental and practical methods occupy a key place due to the direct connection of biology with nature. Local scientists have also conducted a number of studies on biology teaching methodologies. They have scientifically substantiated that the use of innovative methods such as interactive methods, project-based learning, problem-based learning, clustering, brainstorming, and concept maps in teaching biology increases students' cognitive activity.

Modern pedagogical technologies, information and communication technologies are also important tools in improving the methodology of teaching biology. The use of multimedia presentations, virtual laboratories and interactive platforms allows for more interesting and effective organization of biology lessons.

RESEARCH METHODOLOGY

This study aimed to study the effectiveness of the use of educational methods in teaching biology, and used a comprehensive approach to theoretical and empirical methods of pedagogical research. The methodological basis of the research is the competency-based approach, the systematic approach, and the concept of activity-oriented education. Modern pedagogical technologies and innovative teaching methods also form the theoretical basis of the research.

ANALYSES AND RESULTS

Teaching methods are literally the way a teacher conveys knowledge to students and at the same time ensures that students absorb it. Oral, demonstration, and practical methods are widely used in teaching biology in secondary schools.

A group of oral presentation methods of teaching. The oral method includes the following: story, explanation, Oral methods have always been used in the teaching process. There were periods when these methods prevailed among the methods. Currently, oral methods prevail in the traditional education system. In recent years, it has become customary to criticize oral methods and include them in methods that do not actively influence student activity. An objective approach is necessary when assessing methods; its importance cannot be absolutized, exaggerated, and its reduction cannot be allowed.

In the process of teaching, the teacher's word is the main source of knowledge for students, that is, the teacher gives students knowledge through words, directs the students' activity to listen, think, and find answers to the questions posed. Therefore, the teacher's word should not be simple information, but reliable, substantiating, and have the power of activating the students' activity. The teacher's vivid, emotional, evidence-based, logically structured, demonstrative stories, conversations, and lectures have not lost their value even now.

Oral methods allow students to convey a large amount of educational material to their minds in a short time, create problem situations, show ways to solve them, and develop students' speech. Also, many methods are used in combination with oral methods in the teaching process. The successful use of oral methods requires that the teacher:

• mastery of speech culture, including fluency of speech, voice power, intonation, imagery of information, reliability, substantiation, proof, emotional, and personal attitude;

• in electronic textbooks created on the basis of information technologies, it depends on the level of harmony of sound, animation, and movements. The group of oral presentation methods includes conversation, story, and lecture methods.

The story method involves presenting the educational material to students in a holistic manner, asking questions and explaining it without interruption. The story method is used when there is a lot of new concepts and scientific information in the content of a new topic, as well as when the teacher is unable to conduct an active discussion on the educational material, when it is necessary to explain and explain, when the volume of educational material is large and it is necessary to study it at the time specified in the program. The didactic purpose of the story method varies depending on the stage of the lesson at which the story method is used.

The narrative method used in the introductory part of the lesson is considered to prepare students to perceive the content of a new topic. In this process, the narrative method is aimed at creating a need for students to master a new topic, arousing sustained interest, and ensuring an understanding of the purpose of the educational tasks to be completed during the lesson.

The narrative method used in the process of studying a new topic develops the content of the new topic in a logical sequence and consistency, emphasizing key concepts and terms and explaining them using visual aids and convincing examples. In the narrative method used at the end of the lesson, the teacher summarizes the main ideas on the content of the topic studied, concludes,

draws conclusions, and recommends independent work assignments to students. The narrative method, which is used to monitor and assess students' knowledge, requires students to tell stories about specific topics.

Students' stories pave the way for the development of their scientific worldview, speech and communication culture. In this way, students acquire the skills to isolate the main idea in the content of a new topic, to justify and prove their opinion, to present it briefly and concisely, in a logical sequence. The effectiveness of the use of the storytelling method requires the teacher to carefully prepare a lesson plan, choose the most consistent way to cover the content of the topic, collect visual aids, handouts and didactic materials, and ensure the appropriate level of excitement of the presentation. The storytelling method includes the following methodological techniques: vivid presentation of educational material, description of the characteristics of objects, scientificity, consistency, clarity of information, fluency and expressiveness of speech.

The conversation method involves the teacher working with well-thought-out questions that ensure the active assimilation of the laws, concepts and terms in the content of the new topic by students. With the help of the conversation method, the previously acquired knowledge and skills of students are activated, systematized, generalized. A conclusion is drawn and their relationship with the newly studied concept is clarified.

It should be noted that it is recommended to study topics that allow students to master a new topic using questions based on their previously acquired knowledge. The conversation method aims to facilitate the process of students' mastering theoretical knowledge. It aims to prepare the ground for students to master new knowledge using a series of questions, using their previously acquired knowledge and skills, and life experience, and to understand how to apply this knowledge in practice. The conversation method helps students not only master theoretical knowledge, but also expand their scientific worldview, develop their speech, and develop their skills in comparison, analysis, and logical thinking.

The effectiveness of the conversation method depends on the teacher's ability to divide the subject matter into logically complete parts, create a chain of questions for each part, use these questions appropriately throughout the lesson, activate the cognitive activity of the class and direct them to find answers to the questions, motivate each student, and the degree to which the students have mastered the skills of concisely and briefly expressing their opinions and reasoning. This method includes methods of asking interview questions in sequence, asking auxiliary and additional questions at the right time, activating students, correcting errors in students' answers, and summarizing and summarizing.

The explanation method is a clear and concise presentation of educational material based on clear facts, analysis of facts and evidence, with conclusions drawn, and differs from a narrative. Giving short, clear instructions for performing practical work was also considered an explanation.

The lecture method is used when the educational material is large, has a complex logical structure, and is rich in concepts and terms. When using the lecture method, the following requirements should be considered:

1. The content of the lecture should be presented in a deep scientific, ideological and logical sequence based on demonstration tools.

2. Coverage in understandable, emotional, and simple language for readers.

3. Taking into account the age and mental state of the students, a short independent work or question-and-answer session should be held after 15-20 minutes, and the students' cognitive activity should be continued after the activation.

At the end of the lecture, the teacher repeats the conclusions aimed at deepening and generalizing the students' knowledge. Then, the students' answers to the educational tasks are

checked and the completion of the table is reviewed. A question-and-answer session and an educational discussion are held. The teacher's lecture can be structured inductively or deductively, depending on the content and the organization of the students' activities. When the lecture is structured inductively, students are first introduced to phenomena and objects, and then a general conclusion is drawn. In a deductive lecture, the opposite is true, that is, general concepts are first given, and then its content is revealed using objects and phenomena. This method includes presenting educational material in a logical sequence, posing problems, identifying objects, comparing, drawing conclusions, generalizing, and attracting students' attention.

Group of visual methods. The use of visual methods in the teaching process allows for the sensory perception of objects and phenomena, their comparison, identification of specific features, generalization, synthesis, and conclusion based on the content of the educational material. Demonstrative methods are used in the teaching process in combination with verbal. practical. logical. problem-based methods. For example, students are given assignments on the basis of demonstrations orally by the teacher. In the process of completing assignments, demonstrativeness is combined with practical methods, and in solving problem situations that arise in the lesson, it is combined with problem-based methods. The appropriate and effective use of demonstration methods in the teaching process has the following advantages:

• develop visual and figurative thinking in students, activate students' cognitive activity, and master the methods of mental activity;

• clarifying the theoretical issues being studied, modeling phenomena and processes that cannot be directly observed in class;

• allows observing biological objects, conducting experiments on them, applying the theoretical knowledge gained in practice, clarifying and classifying the studied phenomena on the basis of diagrams and tables. The following are among the visual aids used in teaching biology:

• natural and living objects - herbariums, collections, micro and wet preparations, houseplants, animals kept in a living nature corner, etc.;

• specially prepared visual aids that reflect real objects - tables, diagrams, pictures, models, mannequins, etc.;

• conventional and symbolic means of visualization - maps of biogeographic regions, globes;

• technical means of teaching - educational film, film slides, slides, videos, etc.

• multimedia teaching aids - educational computer programs, electronic versions and textbooks, multimedia incorporating sound, animation, dynamic movement and three-dimensional images, etc.

Visual methods include natural and living objects, visual exhibitions, screen tools, computer visual programs, and multimedia demonstration methods, and in particular, the following visual aids are used: illustration, demonstration, educational films, video films, computer educational and modeling programs, electronic textbooks, multimedia demonstration, the exhibition meeting taste and aesthetic requirements, highlighting the content of the lesson, and methods of organizing student activities in sequence.

Group of practical methods. It allows students to apply their acquired theoretical knowledge in practice, to form their skills and qualifications, to develop their creative abilities, to prepare for life, and to direct them to a profession. This method is used in the teaching process in combination with demonstration, problem, and verbal methods. Practical work performed by students serves as a source of knowledge. For this, the teacher must determine the purpose of practical work, select the necessary visual aids to achieve the goal, and clearly formulate

educational tasks. Educational tasks given for practical work must be clear in content, concise, understandable, and goal-oriented.

This group of methods includes methods such as recognizing and identifying natural objects, observing, organizing and conducting biological experiments, caring for plants and raising animals, and they consist of methods such as recognizing and identifying objects, observing and conducting experiments, explaining the progress of practical work to students, drawing up a plan for carrying out practical work, monitoring the implementation of practical work tasks, analyzing the results of completing tasks, self-control, completing and formalizing practical work, observing and experiments.

The method of recognizing and identifying natural objects has a leading position in teaching biology, because in botany lessons, plant organs, plant species, genera, families, and classes are determined. For this, the teacher must have prepared sufficient handouts and didactic materials, herbariums, and collections and use them effectively in his/her place. In zoology classes, in addition to learning about animal organs and their functions, they also determine which type, class, order, and family animals belong to. The effectiveness of this method requires the availability of didactic and handout materials such as wet preparations, models, costumes, and complexes made from animals and their organs that reflect the diversity of the animal world. This method is widely used not only in biology lessons, but also in extracurricular activities, extracurricular activities, and excursions.

The observation method is a purposeful perception by students of the processes occurring in living organisms and phenomena occurring in natural objects. In this method, the data collected by students through their observations are considered a source of knowledge. The observation method is used in all forms of biology teaching. When the observation method is used in the lesson, students independently observe the exhibits related to the content of the lesson, as a result of which they obtain evidence proving the specific characteristics of the objects of observation. Such observation is short-term and serves to achieve a specific goal. Observations such as spring and autumn seasonal changes in plant life, observation of the life of migrating birds, and study of the development of insects are considered long-term continuous observations.

The method of conducting biological experiments - includes the recognition and identification of biological objects, observations, but differs from them in content. Conducting biological experiments allows students to understand the essence of the process or phenomenon being studied, to understand the cause-and-effect relationships between them, and to "rediscover" biological laws.

Summarizing the results of the experiment, drawing conclusions, and formalizing them develops research skills in students. Biological experiments can be conducted in the classroom, in extracurricular activities, in a living nature corner, and on an educational experimental site. Biological experiments can also be short-term and long-term, depending on their duration. Experiments on "Determination of the composition of seeds", "Plasmolysis and deplasmolysis in plant cells", "The effect of amylase on starch" are short-term, while experiments on "Necessary conditions for seed germination", "Seed respiration", "Water evaporation from leaves". "Starch formation in leaves", "The role of earthworms in soil formation", "Study of the laws of inheritance of traits in plants" are long-term experiments.

The effectiveness of this method depends on the teacher organizing the experiments in a specific system, determining the topics and goals of the experiment, preparing clear instructions and learning tasks for each experiment, providing students with experimental objects, necessary tools and equipment, organizing, managing and controlling the activities of students conducting the experiment, and using the results obtained in the lesson.

CONCLUSION

In conclusion, it can be said that practical methods in teaching Biology are widely used in plant care, animal husbandry and breeding. This method, incorporating students' acquired knowledge in biology, observation and physical labor skills, plays an important role in teaching students the basics of agricultural work and directing them to the profession, as well as providing ecological and economic education.

In biology teaching, the topics of practical work on plant care and animal husbandry vary depending on local economic conditions and the specialization of agricultural institutions. Depending on the purpose and content of the practical work, the biology teacher must carefully plan it, fully explain the content of the work to be carried out, and give students clear instructions on how to formalize the results obtained.

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INNOVATIVE APPROACHES TO WORKING WITH TEXT IN IMPROVING THE METHODOLOGICAL PREPARATION OF FUTURE PRIMARY SCHOOL TEACHERS

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Abstract. *The article discusses the importance of working with text as a means of developing reading literacy in primary school students, teaching the methodology of formulating questions based on textbook texts in accordance with the four cognitive processes, developing the skill of gradually complicating questions based on Bloom's taxonomy, strengthening critical thinking through the "Language of Questions", and implementing creative question-building approaches into practice.*

Keywords*: reading literacy, fact-checking, interpretation and connection, inference, evaluation, test, matching.*

Introduction

As one of the primary objectives of every country around the world, the continuous development of the education system is the among the highest priorities of the Republic of Uzbekistan. This is because the prosperity and future of the nation lie in the hands of the young generation who are eager to learn and practice. Along with improving the quality of education, significant attention is also being given to the preparation of qualified and highly skilled pedagogical personnel. In order to develop the education system in our country, a new national program has been created, and based on this program a new generation of textbooks is being published systematically. The quality level of students' acquired knowledge and skills is being assessed not only on the basis of national curriculum requirements, but also through international assessment program standards.

In the context of primary school students' reading skills improvement, developing the text analysis and text comprehension skills creates a foundation for mastering all areas of education more effectively. Therefore, it is appropriate to develop and develop methodological recommendations that assist future primary school teachers working in this field improve their professional skills through new innovative approaches and experiences. One of such innovative approaches is **Bloom's taxonomy**, where the term **"taxonomy"** refers to the principle of arranging the context in a hierarchical order (from lower to higher levels). Bloom's taxonomy is regarded as one of the most significant classification systems of 20th century pedagogy. This concept was developed in 1956 by a group of scholars led by the American psychologist and educationalist **Benjamin Bloom**. The team's primary objective was to identify the levels of cognitive (mental) activity involved in the learning process, organize them in a coherent hierarchy, and thereby enable teachers to plan instructional materials more effectively. Benjamin Bloom categorized educational objectives into three domains: **cognitive, affective, and psychomotor** [2]:

1. **Cognitive** - encompasses skills related to knowledge acquisition, comprehension, and critical thinking. It includes a continuum of activities ranging from becoming acquainted with

information and memorizing it, to practical application of acquired knowledge in order to solve problems.

2. **Affective** - relates to emotions and attitudes, whereby primary purpose is to develop an emotional orientation toward phenomena in the surrounding world. Within this domain, attention is given to how individuals perceive, respond to, and evaluate various life situations, as well as the values, interests, and inclinations of other people.

3. **Psychomotor** - concerns the development of practical skills and focuses on directing the ability to use various tools and techniques toward the achievement of specific objectives [3].

Among the domains outlined above, particular attention is given to the **cognitive domain**. This is because all sequential learning processes are fundamentally grounded in well-established and solidly acquired knowledge. Benjamin Bloom identified **six levels of educational objectives**, arranged in a hierarchical order, each designed to cultivate a specific level of thinking ability. Bloom's taxonomy assists in the accurate formulation of educational objectives, based on which, teachers design learning tasks for students and select appropriate assessment tools. Through the application of the taxonomy, teachers can organize the instructional process in such a way that students not only acquire new knowledge but also learn to analyze it and apply it in real-life contexts.

Bloom's system of objectives is structured from the **simplest to the most complex levels of thinking**. *Remembering* and *understanding* correspond to the lower levels of cognitive development; *application* and *evaluation* represent the intermediate level; whereas *analysis* and *creation* correspond to higher-order thinking skills. According to Bloom, one of the most important responsibilities of a teacher is to guide students toward achieving these higher levels of thinking [4].

1. **Remembering** – **t**he first stage that refers to the recalling and reproducing the information that has been learned. At this level, the learner becomes familiar with key terms, specific facts, and rules, and is able to repeat or recognize them. An overall understanding of the topic starts to form at this stage. To formulate objectives, the following action verbs may be used: *identify, name, recall, organize, list, learn, find, show, write, select*.

2. **Understanding** –the second stage where comprehension and awareness take place. The main indicator of mastering this level is the ability to present the material in one's own words. The learner knows and understands rules and principles, can explain facts and phenomena, and provide commentary on graphs and diagrams. Action verbs: *identify, explain, describe, interpret, compare, summarize, distinguish, give examples, clarify.*

3. **Application** – third stage whose aim is to learn how to apply acquired knowledge in specific contexts. At this level, the learner solves practical problems using new rules, formulas, and laws. Action verbs: *make decisions, distribute, demonstrate, explain, apply, calculate, study, conduct experiments, find, select*.

4. **Analysis** – at the fourth level, the learner's objective is to understand the structure of the material and divide it into its constituent parts. The learner can recognize the principles underlying the creation of information and identify logical inconsistencies or errors. Action verbs: *analyze, emphasize, construct, determine, explain, organize, devise, contrast, differentiate, draw conclusions.*

5. **Synthesis** – upon reaching the fifth level, the learner is able to integrate and consolidate previously acquired knowledge. The learner applies this knowledge to construct new

structures, such as a classification method or a plan for solving a problem. Action verbs: *compose, develop, group, combine, establish, plan, generalize, examine, propose, formulate, analyze*.

6. **Evaluation** – at the highest level, the learner evaluates ideas and concepts using criteria that may be developed independently or with the teacher's guidance. The primary objective is to assess the logic underlying the construction of the material, verify the validity of conclusions, and justify one's own viewpoint. Action verbs: *discover, construct, defend, present, discuss, examine, justify, confirm, predict*.

For primary school students, the effectiveness of working with a text largely depends on the questions and tasks selected by the teacher. Bloom's taxonomy contributes to the development of students' thinking by gradually increasing the complexity of text analysis. When conducting text analysis through Bloom's taxonomy, questions and tasks are designed for each level as follows.

Remembering stage - the learner recalls specific facts from the text.

- Who is the main character in the story?
- Where do the events take place?
- What happens at the beginning of the story?
- Find and name an object or feature mentioned in the text.

Understanding stage - the learner is able to explain the content of the text in their own words.

- Briefly explain what the story is about.
- Why did the character act in that way?
- What kind of mood or feeling did this text give you?

Application stage - the learner applies the acquired knowledge in a close situation.

- Describe a similar event from your own life.
- What would you do if you were in the place of the main character?
- How can the moral idea presented in the text be applied in everyday life?

Analysis stage - the learner divides the text into parts and searches for cause–effect relationships.

- Divide the text into three main events.
- What differences exist between the characters?
- Why did the event end in this way?

Synthesis stage – the learner generates a new idea based on the text that has been read.

- Write a new episode as a continuation of the story.
- Compose a poetic cinquain based on the studied text.
- Write a letter to the character.
- Propose an alternative title for the work.

Evaluation stage - the learner forms his own conclusions and is able to express an independent opinion.

- Were the character's actions correct?
- Why do you think so?
- What is the most important idea expressed in the text?
- What conclusion did you draw from the story?

In primary education, the process of analyzing a literary text through the application of Bloom's taxonomy can be illustrated using the example of the text **"Qoziq"** by **Otkir Hoshimov**, presented in the Grade 4 *Reading Literacy* textbook.

Methodology for creating the "Question Complexity Spiral" based on Bloom's taxonomy:

Stage	Question example	**Expected skill**
Remembering	What grade is a boy in?	Recalling factual information from the text
	Where does the boy take his cow to graze?	Recalling a specific location
	What did he find in the oleaster grove?	Identifying a specific fact
	Where does the boy find the stake?	Recalling the name of a factual element
Understanding	Why does the boy become happy after finding the new stake?	Understanding and explaining the reason
	Why does the boy say, “My heart seemed to pull back”?	Explaining the character’s emotional state
	Why were the family members in the story unable to object to the father?	Interpreting the character portrayal
	Why does the father insist that the boy return the object he found to its place?	Explaining the character’s actions
Application	Give an example of an event similar to the one in the story.	Applying the situation to one’s own life experience
	Would you obey your father’s demands unquestioningly, as the boy does?	Application beyond the text
	What lesson does the father teach his child?	Interpreting the character’s actions
Analysis	Identify the problem in the story and its resolution.	Distinguishing elements of the plot
	Explain the characters of the boy and the father.	Comparing and analyzing the characters
	Explain how the episode describing the oleaster grove is connected to the main idea of the story.	Establishing a link between a detail and the central idea
	What negative consequences might have arisen if the boy had gone to the oleaster grove at night?	Analyzing the character’s actions
Synthesis	If you were in the boy’s place, what would you do?	Developing a new idea
	What title would you give to the story?	Creating a reasoned creative interpretation
	Continue the story with an alternative ending.	Creating a new narrative development
Evaluation	How are the family members’ attitude and respect toward the	Evaluating the characters’ actions

	father shown in the story?	
	In your opinion, what is the main idea of the story?	Evaluating the main idea and drawing a personal conclusion
	What lesson did you learn from this story?	Integrating and synthesizing the ideas

In conclusion

It may be emphasized that Bloom's taxonomy assists future primary school teachers in designing questions and tasks that progress from simple to more complex levels, thereby enabling students to conduct a comprehensive analysis of a text and fully understand it. Mastering the technology of developing a system of questions and tasks for each stage, organizing them according to the principle of progression from simple to complex, and fostering creative as well as critical thinking contributes to effective text analysis and allows students to gain literary experience through engagement with the text.

Furthermore, students learn not merely to memorize a text, but also to understand, apply, and analyze it. As a result, the learning process becomes active, engaging, and logically structured. Each student develops gradually according to his or her individual abilities. Independent thinking, creativity, and logical reasoning are cultivated. Through the use of multi-level questions, students are encouraged to think more deeply. Accordingly, it is recommended that every teacher organize the instructional process effectively and make efficient use of appropriate technologies and pedagogical methods to achieve these objectives.

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PSYCHOLOGICAL AND PEDAGOGICAL ANALYSIS OF THE RELATIONSHIP BETWEEN FAMILY UPBRINGING AND THE DEVELOPMENT OF A CHILD'S EMOTIONAL INTELLIGENCE

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Abstract. *This article examines the psychological and pedagogical foundations of the development of a child's emotional intelligence within the context of family upbringing. The structure of emotional intelligence is analyzed through the lens of both Russian and international research traditions. The study emphasizes the role of family emotional climate and parent–child interaction as key factors in a child's personal development. Particular attention is paid to father's involvement as a determinant of empathy, emotional responsiveness, and self-regulation in early childhood. Based on a review of current studies, the article substantiates the importance of educational and parenting initiatives that enhance father engagement as a resource for the child's emotional and social well-being.*

Keywords: *emotional intelligence; family upbringing; parental interaction; child's emotional development; fatherhood; empathy; educational practice; psychological and pedagogical conditions.*

Introduction

It is widely acknowledged that modern changes in society and education challenge pedagogy and psychology to rethink the role of the family in shaping a child's emotional development. In the context of digitalization, an accelerated pace of life, and increasing information overload, the need for emotional resilience and empathy as components of emotional intelligence is increasing. In this context, family education serves not only as a means of transmitting norms and values but also as a space for shaping the individual's emotional culture. The development of a child's emotional intelligence through family education is a complex and multifaceted psychological and pedagogical phenomenon that requires interdisciplinary analysis. The problem of emotional intelligence lies at the intersection of psychological and pedagogical research and is viewed as a complex personal development that integrates cognitive, motivational, and affective processes.

It is important to note that within the humanistic approach (K. Rogers, A. Maslow, V. Frankl), emotional intelligence is viewed as a central component of personal growth, ensuring inner harmony and the ability to empathically interact. Within the context of the activity-based approach (A. N. Leontiev), the development of a child's emotional competencies occurs through joint activities with adults, which determines the key role of parents in the development of emotional-value relationships [6].

Contemporary researchers emphasize that emotional intelligence is a critical indicator of personal maturity and the success of a person's interactions with the environment. As M. G. Yudina notes, emotional intelligence is "a complex of mental abilities that enable the conscious perception and expression of one's own feelings, understanding and managing the emotional states of others" [10, p. 2]. The author points out that the development of emotional intelligence contributes to the development of such qualities as empathy, tolerance, and communicative flexibility, making it an integral part of harmonious personal development. The definition of "emotional intelligence" is explored in publications by scholars such as D. Goleman, P. Salovey, J. Mayer, D. V. Lyusin, D. V. Ushakov, and others [3; 7; 11]. It is essential to recognize that renowned researcher in the field of emotional intelligence, D. Goleman, points out that the emotional sphere of a person is the most important determinant of the success of human interactions and self-actualization. His concept emphasizes that an individual's ability to recognize, interpret, and regulate their own emotional states, as well as to understand the emotions of others, largely determines the effectiveness of interpersonal communication and the level of adaptation in society. According to the scientist, the development of emotional intelligence is a significant factor in achieving professional and personal success, often surpassing in importance traditional cognitive abilities and IQ [3, p. 58]. Yudina M.G. pays special attention to the fact that emotional intelligence is not only cognitive, but also personal and social in nature: it is formed through the individual's attitude to the surrounding world, as the author notes: "the foundations of this phenomenon are associated with the individual's attitude in society" [10, p. 2]. In her work, N. Yu. Verkhoturova emphasizes that emotional intelligence in a psychological and pedagogical context is interpreted as an integrative system of cognitive and affective abilities that enable the perception, recognition, awareness, and regulation of emotions in oneself and others, as well as their use for constructive interaction and social adaptation [2, p. 114]. The question of the structural organization of emotional intelligence occupies a central place in modern psychological and pedagogical research. Foreign and domestic authors emphasize its multicomponent nature, uniting cognitive, affective, and regulatory aspects of the psyche. Thus, in D. Goleman's model, emotional intelligence is presented as a system of interconnected components—self-awareness, self-regulation, motivation, empathy, and social skills—that ensure adaptive and effective interaction between the individual and the environment [3]. Domestic researchers are clarifying the structure of emotional intelligence in relation to the educational and family environment. N. Yu. Verkhoturova identifies cognitive, emotional-evaluative and regulatory levels, combined into a dynamic system that ensures emotional stability and social adaptation of the individual [2]. It should be highlighted that logical continuation of this theoretical analysis is an appeal to the specifics of the formation of emotional intelligence in the microsocial environment, primarily in the family, which serves as the primary and most significant platform for the emotional and personal development of the child. The family, as the primary social and educational environment, is a natural laboratory for the formation of emotional responsiveness, empathy and the ability to self-regulate. In the domestic psychological and pedagogical literature (A. Ya. Varga, E. O. Smirnova, A. S. Spivakovskaya) it is emphasized that the nature of the emotional relationship between parents and the child determines the stability of emotional reactions, the level of anxiety and the characteristics of the child's communication with peers [1; 8; 9].

Particular attention should be paid to the fact that recent study by Egorova A. I. and Egorov I. V. devoted to the study of the factors of infantilism in youth showed that "i.e., excessive care and guardianship of parents are associated with a high level of sensitivity, susceptibility, dependence of

the child and a low level of his independence" [4; [p. 137]. The study conducted during the COVID-2019 pandemic showed that "in families coping stably with the pandemic, adolescents are distinguished by emotional well-being, social activity, and psychologically adaptive behavior" [5; p. 21]. From particular importance is the study of the father's role in the development of a child's emotional intelligence. A number of studies (A. Ya. Varga, A. S. Spivakovskaya, E. O. Smirnova) show that paternal involvement and emotional responsiveness contribute to the development of a child's confidence, emotional stability, and ability to reflect [1; 8; 9]. It is the father who often serves as a model for self-regulation and constructive behavior in emotionally charged situations. For example, E. O. Smirnova notes that a father's active participation in raising a child increases the level of emotional responsiveness, promotes the development of the ability to understand and adequately express emotions, and also develops a readiness for constructive interaction with peers and adults [8].

Conclusion. The conducted analysis allows us to conclude that a child's emotional intelligence is formed in the context of family interaction, where the emotional climate, communication style, and the degree of involvement of parents, especially the father, are of key importance. A harmonious emotional environment promotes the development of empathy, self-regulation, and emotional stability, which ensures successful socialization and personal well-being of the child.

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THE PEDAGOGICAL PROFESSION AND ITS PROFESSIONAL COMPETENCIES

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Abstract. *Professional competence implies not merely the acquisition of separate knowledge and skills by a specialist, but the mastery of integrative knowledge and actions within each independent field. It also requires the continuous enrichment of professional knowledge, the study of new information, the ability to recognize important social demands, to search for new data, process them, and apply them in one's professional activity.*

Keywords*: competence, professional competence, qualities of professional competence, pedagogical professional competence, individual development program, teacher's individual development program, self-development, teacher's work on self-improvement.*

INTRODUCTION

In the conditions of market relations, strong competition in the labor market requires every specialist to possess professional competence and to continuously improve it in order to remain competitive. What, then, is competence? What qualities form the basis of professional competence? What competence-related qualities should a teacher develop and demonstrate? This section discusses these and related issues.

> The English term "competence" literally denotes "ability." In its broader sense, however, it refers to the effective use of theoretical knowledge in practice, as well as the demonstration of a high level of professional qualification, mastery, and talent in one's activity.

The concept of "competence" entered the field of education as a result of psychologists' scientific research. From a psychological perspective, competence refers to a specialist's ability to behave appropriately in non-standard situations and unexpected circumstances, to engage in effective communication, to adopt new approaches in interactions with opponents, to perform uncertain tasks, to use contradictory information, and to possess a plan of action in progressively developing and complex processes.

> **Professional competence** is the acquisition by a specialist of the knowledge, skills, and abilities necessary to carry out professional activity, as well as the capacity to apply them in practice at a high level.

Professional competence does not imply merely the acquisition of separate knowledge and skills by a specialist, but rather the mastery of integrative knowledge and actions within each independent field. It also requires the continuous enrichment of professional knowledge, the study of new information, the ability to recognize important social demands, to search for new data, process them, and apply them in one's professional activity.

- Professional competence becomes particularly evident in the following situations:

- in complex processes;
- when performing uncertain tasks;
- when using contradictory information;
- when being able to develop a plan of action in unexpected situations.

A specialist who possesses professional competence:

- consistently enriches their knowledge;
- assimilates new information;
- deeply understands the demands of the time;
- searches for new knowledge;
- processes it and effectively applies it in practical activity.

The following qualities constitute the foundation of professional competence:

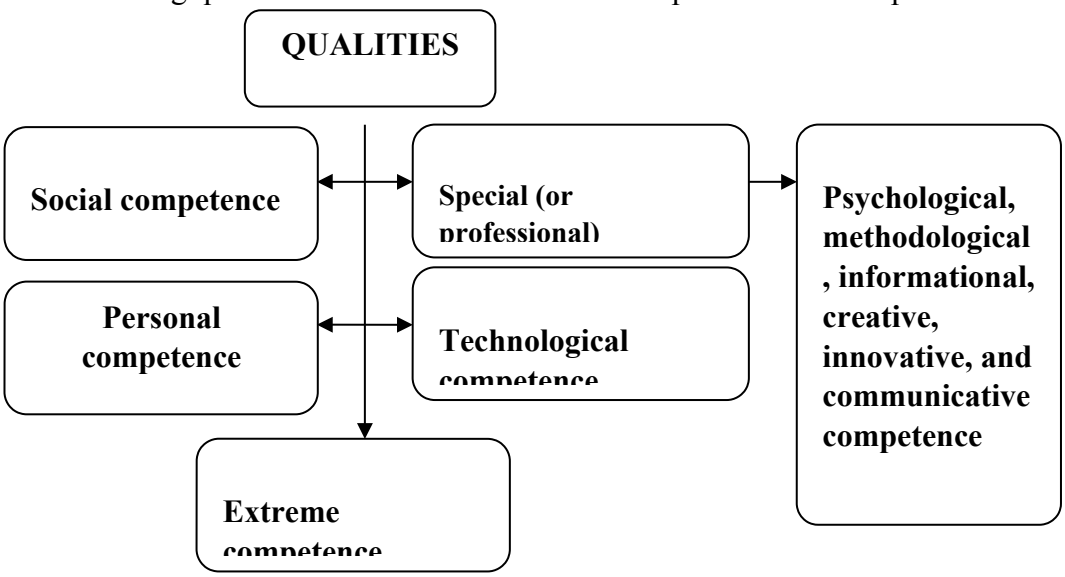


Figure 1. The following qualities underlying professional competence

Below is a brief explanation of the essence of the qualities underlying professional competence.

1. Social competence — the possession of skills and abilities to actively participate in social relations and to engage in communication with subjects involved in professional activity.

2. Special competence — readiness to organize professional-pedagogical activity, to rationally solve professional tasks, to realistically evaluate the results of one's activity, and to consistently develop knowledge, skills, and abilities. This competence includes psychological, methodological, informational, creative, innovative, and communicative components, which reflect the following:

1. **Psychological competence** — the ability to create a healthy psychological environment in the pedagogical process, to organize positive communication with students and other participants in the educational process, and to identify and eliminate negative psychological conflicts in a timely manner;
2. **Methodological competence** — the ability to organize the pedagogical process methodologically, correctly determine forms of educational activity, select appropriate methods and tools, and apply them effectively;
3. **Informational competence** — the ability to search for, collect, select, process, and effectively use necessary and useful information in the information environment;

4. **Creative competence** — a critical and creative approach to pedagogical activity and the ability to demonstrate one's creative skills;
5. **Innovative competence** — the ability to propose new ideas aimed at improving the pedagogical process, enhancing educational quality, and increasing the effectiveness of upbringing, as well as successfully implementing them in practice;
6. **Communicative competence** — the ability to maintain sincere communication with all participants in the educational process, including students, to listen attentively, and to exert a positive influence on them.

3. Personal competence — achieving continuous professional growth, improving one's qualification level, and demonstrating internal potential in professional activity.

4–5. Technological competence — mastery of advanced technologies that enrich professional-pedagogical knowledge, skills, and abilities, and the ability to use modern tools, equipment, and technologies.

6. Extreme competence — the ability to make rational decisions and act appropriately in emergency situations (natural disasters, technological failures) and when pedagogical conflicts arise.

In the works of pedagogical scholars, various aspects and structural components of competence have been identified and studied, allowing for a broader and more detailed pedagogical understanding of this concept. According to S. E. Shishov, competence can be defined as:

- a general capability based on knowledge, experience, values, and dispositions acquired through learning;
- the ability to establish a connection between knowledge and situations and to find solutions appropriate to the problem (competence can only be considered as such when it is manifested in a particular situation; otherwise, it remains a hidden potential).

L. M. Dolgova, P. V. Simonov, and others consider competence to be the ability to act based on acquired knowledge. Unlike "knowledge, skills, and abilities," which imply actions similar to given models, competence presupposes independent activity based on universal knowledge. Dolgova emphasizes that competence represents knowledge and skills manifested in social practice when socio-cultural requirements and societal demands are placed on educational outcomes.

According to V. V. Bashev, competencies are individual abilities that manifest themselves in the transfer of these abilities to new conditions when circumstances change. Their fields of application determine their specificity (mathematical, linguistic, political, etc.). A competent person functioning effectively in society must be able to:

1. analyze the situation in which they find themselves;
2. establish communication with others;
3. make decisions;
4. organize individual and collective actions to implement decisions;
5. master new methods of activity.

Thus, competence can be interpreted as capability, readiness, and opportunity, as well as the result of certain actions. In other words, competence is an activity-related category manifested in professional, social, and other forms of activity aimed at fulfilling assigned tasks.

Competence represents a certain level of development of skills and professional experience necessary for an individual to function successfully in society in general and in the professional sphere in particular, as well as to interact effectively with surrounding objects and subjects.

A number of studies have examined professional competence specific to teachers and its distinctive features. Among them are the works of A. K. Markova and B. Nazarova.

According to A. K. Markova, the professional competence of a teacher consists of the following structural components:

1. Special (professional) competence — the ability to organize professional activity at a high level;
2. Personal competence — self-development and self-expression;
3. Social competence — the ability to organize collaborative activities;
4. Individual competence — self-management, professional development, and innovation.

In the context of Uzbekistan, professional competence specific to teachers has also been studied. According to B. Nazarova, it includes:

1. Special (professional) competence — organization of professional activity at a high level;
2. Autocompetence — the ability to develop oneself socially and professionally;
3. Social competence — collaborative organization of professional activity and social responsibility;
4. Extreme professional competence — the ability to function in unexpected situations.

The concept of "pedagogical mastery" was scientifically substantiated in the 1980s–1990s and began to be taught as an independent subject in higher education institutions. With the introduction of the subject "Pedagogical Technology," the foundations of pedagogical mastery were incorporated into its content. Before discussing the professional mastery of preschool educators, it is appropriate to clarify the concepts of "mastery" and "pedagogical mastery."

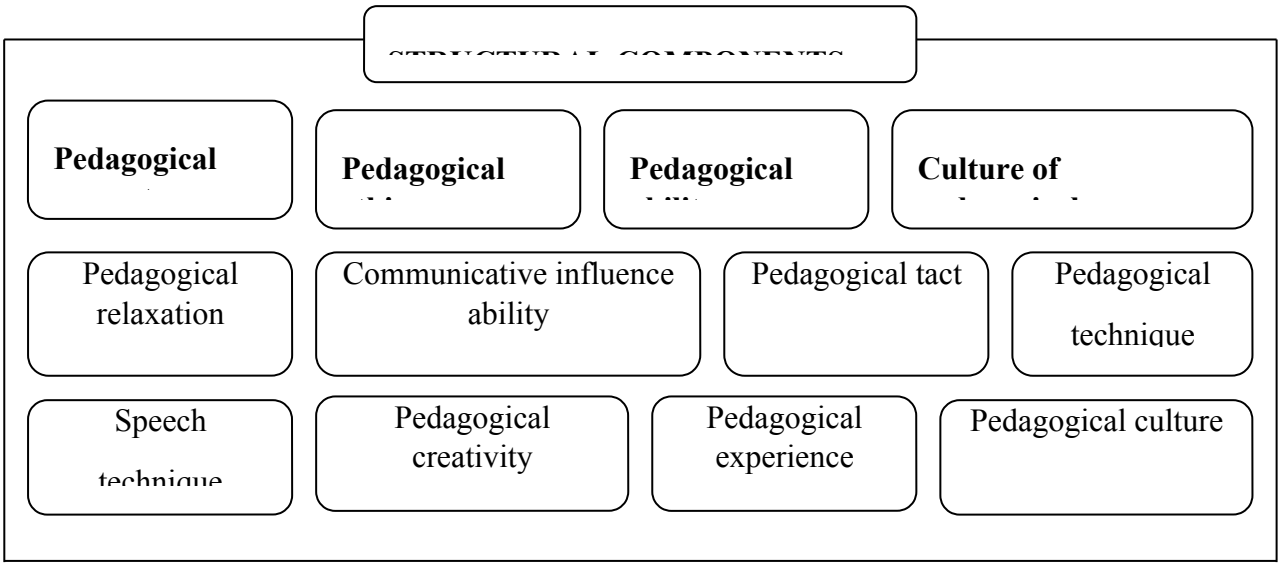
Mastery — the ability to perform a task or activity at a high level with exceptional skill and without difficulty.

Pedagogical mastery — the teacher's ability and competence to organize and manage the pedagogical process with a high degree of skill from organizational, methodological, psychological, and subjective perspectives.

Mastery (from the Arabic *"mahorat"* — skillfulness, proficiency, dexterity) is the ability to perform a task or activity at a high level, with exceptional skill and without difficulty.

Pedagogical mastery is the teacher's possession of the ability and competence to

Pedagogning mahorati bevosita kasbiy-pedagogik faoliyatda ko'rinadi. SHu sababli u A teacher must deeply understand the general essence of the pedagogical process, be aware of the fundamental principles that play a leading role in this process, and thoroughly master the mechanisms for effectively organizing pedagogical activity. As an active participant in the educational process, a teacher's pedagogical mastery reflects their personality, professional experience, civic status, professional standing, sufficient command of pedagogical techniques, and the individuality of their professional activity. Pedagogical mastery represents an integrated system that includes a number of essential qualities. In particular:



Important components of pedagogical skills

The basis of pedagogical skill is pedagogical knowledge.

Pedagogical knowledge is the ability of a teacher to organize professional activities in accordance with existing social requirements, legal norms and standards, and the level of professional training.

The professional knowledge of a teacher includes the ability to establish a subjective relationship with a student; the ability to consistently perceive the essence of pedagogical processes, pedagogical reality; the ability to study the foundations of world pedagogical culture and national pedagogical experience, apply them to one's activities on the basis of integration; constant awareness of innovative innovations; generalization of personal experiences and transfer to students; professional dedication and mastery of pedagogical technologies are manifested.

At the heart of pedagogical knowledge, pedagogical reflection (Latin "reflexio" - return, reflection) is also prominent. In the sources, the concept of "reflection" is interpreted as "a person's theoretical activity aimed at understanding and comprehending his own actions and their foundations; a separate activity of cognition", "understanding the essence of personal experiences, feelings and thoughts through thinking."

Pedagogical reflection is the teacher's understanding of the essence of the individual's consciousness, tasks, values, interests, motivations, thinking, perception, decision-making, emotional reactions, actions, etc.

A teacher's ethics are also clearly reflected in his or her work. Moreover, pedagogical ethics are considered one of the important requirements and factors ensuring the success of educational and upbringing processes.

Pedagogical ethics is a system of moral requirements imposed on a teacher regarding his or her attitude towards himself or herself, his or her profession, society, students, and other participants in the educational process.

These requirements are an important factor in the development of the pedagogical work and activity process organized by the teacher. The system of pedagogical etiquette requirements is of

particular importance in the fulfillment of professional duties by the teacher, his moral obligations to society, the pedagogical community and the student.

Pedagogical etiquette plays a leading role in clarifying the essence of such main categories as pedagogical ethics and moral values reflected in the pedagogical process. All universal and national moral values also play a leading role in the activities of the teacher.

1. Professional and pedagogical duty. Universal moral values such as goodness and evil, justice and injustice, honesty and deceit, mercy and cruelty, sincerity and darkness, patriotism and patriotism, peace and war serve as a kind of measure in the life, lifestyle and behavior of people. In pedagogical activity, a teacher must be able to glorify these values and organize his activities based on them. In addition, each teacher must be able to fully understand his professional and pedagogical duty and organize practical actions to fulfill it. A teacher's clear determination of what tasks he must perform before society, its members, the pedagogical and student community, and what principles he must rely on in fulfilling his professional and pedagogical duty, creates the opportunity to independently determine his position as an individual, a specialist, and a citizen. If he can organize his professional activities in accordance with existing ethical principles, then his self-esteem will increase and he will gain confidence in his own strength. This will encourage the teacher to achieve new achievements. If a teacher understands his professional and pedagogical duty, but cannot organize it in accordance with existing moral requirements, then, first of all, he loses self-respect and cannot appreciate himself as a person.

2. Pedagogical justice. “The concept of justice is determined by certain historical conditions and socio-economic relations. The moral aspect of justice means treating people equally in interpersonal relations, not violating each other's dignity, and observing the rules of morality.” In addition, justice serves to characterize the interrelationship between human dignity and its recognition by society, existing moral rules and obligations. Pedagogical justice has its own characteristics, it reflects the level of moral education (noble deeds, determination, seriousness, humanity) of the teacher in assessing the behavior of his students in accordance with their merits before the community.

3. Pedagogical obligation (pedagogical deontology). One of the important categories of pedagogical ethics - the concept of pedagogical obligation - includes the requirements and moral guidance and instructions imposed by society on the teacher's personality, his fulfillment of a number of pedagogical obligations. In organizing professional activities, a teacher must be able to fulfill the following obligations: to perform specific labor tasks, mainly intellectual labor tasks; to properly organize interaction with students, their parents, colleagues; to deeply understand his personal attitude to his chosen profession, to students and the pedagogical community, and to society. Among the pedagogical responsibilities, it is also necessary to demonstrate a creative attitude to the organization of professional activities, self-demandingness, striving to enrich professional knowledge and improve pedagogical skills, establishing a respectful and demanding relationship with students and their parents, mastering the skills of positive resolution of complex pedagogical conflicts, etc.

4. Pedagogical reputation. The pedagogical reputation of a teacher guarantees the effectiveness of the professional activities organized by him.

Pedagogical reputation is the moral status of a teacher recognized by students, their parents, the pedagogical team, and society.

Relying on the reputation gained by the teacher, he controls the behavior of students, gains their trust. Pedagogical reputation also reflects the moral, ethical and pedagogical-psychological preparation of the teacher. The level of reputation possessed by the teacher is determined by his deep knowledge, intelligence, skills, attitude to his work, etc. Pedagogical ability. How effective and successful the pedagogical process is depends on the teacher's pedagogical ability. In one of the sources, the concept of "ability" is interpreted as follows: an individual psychological characteristic that ensures that a person can easily master any activity.

Ability is divided into two groups: general and special abilities. "While general abilities are manifested in the main types of individual activity, abilities that are manifested in certain types of professional activity (mathematical, technical, musical, visual arts, literature (poetry and prose), physical training, etc.) are called special abilities... One of the leading characteristics of abilities is the creative imagination of the essence of things and phenomena."

Pedagogical abilities are characteristics that are important for ensuring the rational organization and conduct of pedagogical activities by a teacher and the effective implementation of practical tasks.

Conclusion

The following are the priority characteristics of pedagogical ability. Priority characteristics of pedagogical ability:

- pedagogical tact (the ability of the teacher to observe the existing moral principles, rules of behavior in communication with students in various forms of activity, to approach them correctly);
- pedagogical observation (the ability of the teacher to notice even the most simple features inherent in students);
- love for students (to love them, to show kindness, to share their inner experiences, feelings, hopes, aspirations in life, to care for them in difficult situations);
- the need to transfer knowledge (the desire as a teacher to pass on the knowledge he has to students).

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MECHANISMS FOR PREPARING DIRECTORS OF PRESCHOOL EDUCATIONAL ORGANIZATIONS FOR STRATEGIC MANAGEMENT

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Abstract. *This article examines the mechanisms for preparing directors of preschool educational organizations for strategic management in the context of contemporary early childhood education and care. The paper argues that the work of a preschool director can no longer be reduced to administrative supervision, routine control, or compliance with regulations. Effective directors are expected to build a shared vision, align pedagogy and management, develop staff capacity, engage families and communities, use data for improvement, and coordinate institutional development across changing policy and social contexts. Drawing on recent international research and policy documents, the article identifies the main preparation mechanisms that can strengthen directors' readiness for strategic management: competency-based selection and standards, specialized pre-service and in-service leadership training, mentoring and coaching, distributed leadership structures, data-informed planning, system-level support, and leadership ecosystems linking local and higher-level governance.*

Keywords: *preschool leadership, strategic management, early childhood education, director preparation, pedagogical leadership.*

INTRODUCTION

The quality of preschool education depends not only on curriculum, infrastructure, or staff qualifications, but also on the leadership capacity of those who direct preschool organizations. International evidence synthesized by the OECD shows that leadership in early childhood education and care plays a central role in improving and sustaining process quality, particularly through its influence on organizational climate, staff learning, and the conditions that support children's development and well-being [1]. This means that the director of a preschool educational organization is not simply a scheduler, inspector, or custodian of paperwork. The director becomes the person who translates broad policy goals into institutional priorities, shapes working culture, coordinates people and resources, and ensures that educational quality is not episodic but systematic.

At the same time, UNESCO's recent global synthesis on leadership in education emphasizes that effective leaders must be selected, prepared, and supported intentionally, and that strong leadership requires at least four core dimensions: setting expectations, focusing on learning, fostering collaboration, and developing people [2]. Although that framework was developed broadly for education leadership, it is highly relevant to preschool organizations, where strategic management must combine pedagogical sensitivity with organizational coordination. In preschool settings, leadership is especially complex because the organization sits at the intersection of education, care, family partnership, inclusion, and local community development. Therefore,

preparing directors for strategic management requires mechanisms that are broader than managerial instruction and deeper than short-term administrative training.

MATERIALS AND METHODS

A first mechanism for preparing directors of preschool educational organizations for strategic management is the creation of **clear leadership standards and competency-based selection criteria**. UNESCO notes that leadership preparation programmes too often overlook essential dimensions of leadership, and that barely half of reviewed programmes focus on any of the four core leadership dimensions, while only about one third focus on all four [2]. That finding is important because weak preparation often begins with vague expectations: if the system does not define what a preschool director must know and be able to do, training becomes fragmented and appointments risk favoring formal seniority over strategic competence. For preschool directors, a competency framework should include the ability to formulate and communicate institutional vision, plan strategically, manage human and financial resources, coordinate pedagogical improvement, analyze data, build internal collaboration, and maintain productive relations with families and community partners.

UNESCO's summary report explicitly connects leadership with skills such as using data, prioritizing, planning, implementing, supervising, assessing, communicating effectively, and promoting professional growth [2]. In addition, the report notes that some countries explicitly expect principals to have visionary and strategic planning skills that contribute to organizational excellence [2]. Transferred to preschool education, this suggests that leadership preparation must start before formal training begins, at the stage of recruitment and role definition. A director selected only for compliance experience may keep the institution running; a director selected for strategic competence may move the institution forward. That difference is not decorative. It shapes the long-term developmental trajectory of the preschool organization.

RESULTS AND DISCUSSION

A second mechanism is specialized leadership preparation that integrates pedagogical leadership with strategic management, rather than separating the two. The OECD literature review on leadership for quality early childhood education and care stresses that supports for ECEC leadership are needed in such areas as recruitment, preparation, professional development, credentialing, compensation, and job design [1]. The same review shows that leadership influences quality not only directly but also indirectly, by creating a positive organizational climate that supports staff well-being, shared decision-making, professional development, and a culture of learning and improvement [1]. This is crucial for preschool directors because strategic management in early childhood settings cannot be modeled on narrow corporate control. A preschool director must understand budgets and staffing, but also child development, pedagogy, team learning, and family engagement.

Strategic management in such an organization therefore means aligning resources, people, routines, and pedagogical goals in a coherent way. Research summarized by the OECD also indicates that leadership can occur at multiple levels within an organization and may combine hierarchical and distributed forms [1]. Preparation programmes should reflect that reality. Instead of teaching directors to "manage subordinates," they should prepare them to build structures in which teachers and other staff can participate in improvement processes, take responsibility, and contribute to institutional learning. In practical terms, specialized preparation should include modules on strategic planning, pedagogical supervision, quality assurance, financial stewardship, institutional communication, change management, and inclusive governance. Strategic leadership

in preschool organizations is a hybrid craft: part educational, part organizational, part relational. Any preparation model that trains only one of these parts produces leaders who are overconfident in one corridor and lost in the rest of the building.

A third mechanism is practice-embedded leadership development through mentoring, coaching, collaborative learning, and action-oriented projects. Evidence reviewed in Lee and colleagues' study of a leadership development initiative for early educators is especially helpful here because it moves from abstract principle to operational design [4]. Their article reports that effective leadership development programmes often combine formal training with person-centered supports such as mentoring, network building, and peer learning [4]. The same study refers to programmes for early childhood directors that use collegial support, community building, mentorship, data-driven programme improvement plans, and access to practical tools and resources [4]. In their own initiative, participants developed a theory of change, learned to think strategically, build consensus, collaborate, mentor others, and prepare an action plan for implementing change in their workplace or wider system [4].

The programme's cohort model encouraged collaboration and collegiality, while participants reported gains in leadership knowledge, collaboration, theory of change, and implementing change [4]. For the preparation of preschool directors, these findings matter because strategic management is not mastered by reading policy documents in isolation. It develops when future directors learn to diagnose problems, formulate a rationale for change, map stakeholders, test assumptions, design implementation steps, and communicate plans convincingly. Mentoring and coaching help bridge the usual gap between theory and organizational reality. Peer learning helps future directors compare contexts, challenge routine thinking, and build professional networks that remain useful beyond training. Action projects and capstones prevent leadership preparation from floating into abstraction; they force participants to turn ideas into operational plans. That is where strategic management stops sounding impressive and starts becoming accountable.

A fourth mechanism is the development of distributed leadership and staff capacity inside the preschool organization. OECD research shows that leadership in ECEC settings is not limited to a single formal leader and may involve distributed structures in which teachers or other staff engage in leadership [1]. The same review finds that effective leadership is associated with supporting staff professional development and learning, engaging staff in decision-making and leading change, and creating structures that enable teachers to collaborate and plan for improvement [1]. This is not a soft add-on to strategy; it is one of strategy's operating conditions. A preschool director who attempts to carry every responsibility personally may appear energetic for a while, but such a model usually produces bottlenecks, shallow participation, and weak institutional memory.

Strategic management in preschool settings requires the director to build leadership pathways within the team, clarify roles, protect time for planning and reflection, and cultivate a workplace climate in which initiative is not punished. The OECD review explicitly points to the importance of staff leadership pathways, dedicated planning time, and support structures that sustain staff collaboration and improvement [1]. From the perspective of preparation, this means that directors should be trained not only to make plans, but also to mobilize others around them. They need skills in delegation, facilitation, mentoring, conflict management, and collaborative inquiry. Strategic documents do not implement themselves. They travel through people. If the team

is excluded from the process, the plan becomes a framed object on the wall—useful mostly for collecting dust in a respectable manner.

CONCLUSION

The preparation of directors of preschool educational organizations for strategic management requires a coherent architecture of mechanisms rather than a narrow administrative course. International evidence shows that leadership in early childhood settings influences quality through organizational climate, staff development, collaborative culture, and the alignment of institutional processes with children's learning and well-being [1]. At the same time, global leadership analyses demonstrate that leaders need explicit preparation around vision, learning, collaboration, and people development, supported by fair selection, professional growth opportunities, and enabling conditions for decision making [2]. These findings lead to a clear conclusion: strategic management competence in preschool leadership does not arise automatically from teaching experience or seniority. It must be built intentionally.

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SPECIFIC CHARACTERISTICS OF EDUCATIONAL ENVIRONMENT DEVELOPING READING LITERACY IN PREPARATORY GROUP CHILDREN

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Abstract. *This article provides decrees in recent years in preschool educational organizations about child development groups and preschool preparation, about the educational environment and the unique influence of centers on the development of children's reading literacy, child monitoring, development and the uniqueness of the environment on the individual, and provides information about development reading literacy based on a targeted approach.*

Keywords: *development, communication, individualization, observation, analysis, planning, application, understanding, personality, interest, needs, literacy, reading, intellectual.*

Introduction

Against the background of fundamental reforms and rapid development in the Republic of Uzbekistan in recent years , special attention is being paid to the preschool education system. Ensuring the implementation of the child's right to education, maintaining and strengthening the child's physical, mental and spiritual maturity, as well as ensuring the child's adaptation to society and readiness to continue education in general education institutions are the main goals of preschool educational organizations [3] is considered.

These goals are based on the task of ensuring the child's adaptation to society and readiness for primary education. In the post-independence period, attention was paid to the issues of educating preschool children and preparing them for school education. However, it was observed that the quality and efficiency of the work in this regard do not meet the requirements of the time, and the existing shortcomings and problems in the field are not eliminated in time. This negative situation made it necessary to eliminate the factors that hinder students' learning at the next stages of education.

It is no exaggeration to say that since 2017, under the leadership of President Sh.M. Mirziyoyev, the main attention of the state social policy has been focused on preschool education. The head of state consistently analyzed the problems and deficiencies in the field of preschool education, including the fact that the number of state-owned preschool education organizations has decreased by more than 47 percent, that the material and technical base of existing educational organizations does not meet modern requirements, and that personnel working in preschool education organizations have to go to secondary special education. it was emphasized that the classes in the preparatory groups for school are not enough, they are not held at the level of modern requirements, especially the low coverage of children.

At the meeting held on August 16, 2017 under the leadership of President Sh.M. Mirziyoyev, the issues of strengthening the national gene pool in our country, educating the young generation as mature personnel were deeply analyzed, and many directions for the development of the education system were determined. In particular, tasks related to fundamental structural reform of the preschool education system, increasing the coverage of children in preschool education

organizations were shown. In our republic, 27.7% of children were enrolled in pre-school education organizations, and today the coverage of children in pre-school education has reached 72%.

Methodology

Preschool education in accordance with the Decree of the President of the Republic of Uzbekistan dated September 30, 2017 "On measures to fundamentally improve the management of the preschool education system" [1] and the Decision PQ-3305 "On the organization of the activities of the Ministry of Preschool Education of the Republic of Uzbekistan" all aspects of comprehensive development of the system, healthy and well-educated children , and improvement of the quality of school education were defined.

In order to eliminate the above-mentioned shortcomings and problems, to further improve the preschool education system, to ensure equal access of children to quality preschool education, and to develop the non-state sector of preschool education services, the "Concept of Development of the Preschool Education System of the Republic of Uzbekistan until 2030" was approved[2]. The concept became the basis for determining the goals, tasks, priority directions, medium- and long-term stages of development of preschool education in our country, as well as development of programs and complex measures aimed at the development of the field of preschool education.

As a result, consistent measures were developed and implemented in the field of preschool education in our republic in 2017-2022. Equipping development centers in pre-school educational organizations is an important factor in the organization of educational activities, as well as activities related to the uniqueness of child development, responding to children's interests, i.e. their level of mental, social and spiritual maturity. These types of activities are aimed at children's interest in nature, satisfaction with the experience, and the desire to test their ideas in the experiment. It is important to help children find answers to their own questions.

After all, while searching for an answer to a question, the child's interest, reasoning and attention are automatically activated. In this case, the role of the educator is to jointly search for ways to find an answer that satisfies the child without simplifying the question and without confusing the child with a lot of information. In the process of education in development centers, children themselves begin to voluntarily choose the appropriate development center. Working in independent groups and individualization of children, the teacher comes up with such types of activities, in which everyone is given the same instruction, but each child is allowed to achieve success independently based on it.

The level of individualization can be optimized. Choosing the type of activity that requires dexterity and resourcefulness, and carefully observing the children, the educator can change or adapt the tasks and materials if necessary. The design of the centers should be aesthetic, attractive to children and create a desire for independent activity [5]. Equipment in developmental centers should be safe, and didactic materials should be child-friendly and age-appropriate.

Development centers should provide opportunities for contact with children and adults, their joint activities, as well as self-activity. According to the thematic planning, educators should think about providing development centers with didactic materials and game equipment, as well as equipping them with equipment. Centers can be filled with joint activities of children and educators and handicraft products. At the beginning of the week, according to the thematic plan of the pedagogue, materials are prepared and equipped for each center [5]. On the basis of the "Ilk Kadam" state curriculum, the following types of development centers will be operated in preschool educational organizations:

1. " Language and speech center _

2. " Construction, design and mathematics " center .
3. " Role-playing games and staging " center .
4. " Art " center .
5. " Science and nature " center . _

Each developmental center is important for children's speech and literacy development . In particular, this process at the "Language and Speech" center includes didactic games, thematic, large and small format pictures, visual materials, picture series to determine the sequence of events, grouping according to various criteria, etc., a library of children's books, thematic albums, riddles. albums, sets of magnetic letters, "Picture Alphabet" cubes. This is to develop children's speech and teach them literacy.

In the building-making construction and mathematics center, a child learns building-making, mathematical knowledge, and communication skills. At the same time, the fine motor skills of children develop, the child is constantly in motion, learns what he does not know from each other, teaches each other. This will teach children to structure their speech grammatically, to develop their creative activities, and to pronounce correctly.

The center of role-playing games and dramatization, children can creatively dramatize familiar stories and events, thereby developing their speaking skills. In the role-playing game, children who live in certain situations serve to form positive interpersonal relationships in a group, encourage children to follow the norms and rules of the culture of behavior in society, friendly team relations.

The "Sanat" center is a children's favorite and always full of children development center. Children love to draw, clay, cut and make. The purpose of the art center is to form children's creative potential, to develop interest in visual arts, to form and develop aesthetic skills, imagination, artistic and creative abilities, independence, activity, fine motor skills.

Throughout the year, toys and manuals are changed, removed and put back to keep children interested and engaged. Thus, when creating a subjective development environment of any age group in a preschool educational organization, it is necessary to take into account the psychological characteristics of the constructive interaction of the participants in the educational process, the design and ergonomics of the modern environment of the preschool educational organization.

At the "Science and Nature" center conditions for enriching children's knowledge about the diversity of nature and the world should be created. In this center, children learn to care for plants. For this, they need watering cans, sticks to soften the soil, a sprinkler, a cloth to wipe the leaves, and small tools for working on the lawn. For daily monitoring of weather changes, you need "Nature Calendar", all the necessary pictorial and poster materials about nature and ecology, which will positively contribute to the development of children's skills in the diversity of flora and fauna, seasonal changes in nature, and the preservation of natural heritage. . Also, in this center, you can allocate a space for conducting research - a mini laboratory (just a shelf). Materials for research are placed here: magnifying glass, containers, measuring cups, trays, sticks, tubes, watering cans, sand, clay, stones, wooden blocks, etc. In the corner, it is recommended to have a file of experiments with water, sand, air, magnet, etc. [5] .

The responsibility of the educator of the preschool educational organization in the correct organization of the educational process is incomparable. At the same time , what, when and where pedagogues it is important that they choose what they want to observe and assess in their child's development and learning. Information obtained by the pedagogue as a result of observations it is necessary for him to create a basis for independent analysis of educational approaches and methods

used in practice in working with children. Such an assessment allows the pedagogue (as well as parents and other involved professionals) to see the child's development, understand his learning and development needs, and plan ahead [5]. There are two types of surveillance - formal and incidental (informal).

Informal monitoring of the child through which a lot of information can be obtained without informing him in advance (for example, when a child is naturally attracted to a game). Official observation may cause the child to become irritable or act involuntarily, and the child may not play or interact with other children at all. Formal observation is more focused on tracking a child's development of specific skills or competencies, or their knowledge and understanding.

Formal and informal systematic observation is the main method of gathering information for pedagogical assessment of the child's development and current state.Observation is an effective way to gather information about preschool children's development and learning. The purpose of monitoring and evaluation is to study the individual characteristics of the child and, based on this, to plan and implement an educational approach focused on his personality. The following 5-step scheme is described in preschool pedagogical literature ("Early Years", 2013). This is a cycle for conducting observations aimed at improving the quality of program implementation:

Step 1 . Follow up work - information gathering process.

Step 2 . Analyze it - asking questions about the content of what was observed.

Step 3.Plan work – planning next steps for continued learning and development.

Step 4 . Hand it - implementation of the thought-out plan.

Step 5 . Understanding (achieving reflection) - evaluating the effectiveness of the plan.

It helps the teacher to understand that his actions have consequences (*for the teachers themselves and for others)* . Preschool education is an important aspect of educators' activities and helps them to act more purposefully. Qualified educators reflect on what works and what doesn't work well, what needs to be improved, and how to solve problems in their approach and teaching methodology. Analysis of data collected from observations and assessments of child development Based on this, the educator can review the teaching methods used in practice to ensure the full development of the child in accordance with the state requirements for age and developmental areas, and then plan changes for implementation, and this process is based on a person-centered approach.

A person -centered approach focuses on the individual and age characteristics of the child and takes into account where each child is in the educational process, what are the educational needs for all-round development. The quality of the person-centered teaching approach is based on the teacher's ability to observe, record what he sees and hear, reflect and analyze, plan, and not apply one-size-fits-all educational approaches to each child. it also depends on knowing how to develop their competencies. It is therefore dedicated to discovering how to observe children, how to document our observations of how children learn and develop, and which reflections help us better identify children's interests, needs and strengths in planning and organizing work. Thus, the main goal is to offer pedagogues of preschool educational organizations methods and tools for monitoring and evaluating the development of preschool children, timely analysis and determination of work measures and methods, improving the results and comprehensive development of the child.

The purpose of the observation is to study the qualitative indicators of children's developmental achievements in well-organized educational environments in preschool educational institutions . Tasks of pedagogical control:

● collecting evidence that reflects the development of the child's development areas and is expressed in his development parameters;

● creating objective and informative ideas about the trajectory of individual development of each pupil;

● the activity of studying the child's development in the development of various types of education;

● individualization of the educational process (including support for children, creating an individual educational trajectory or pedagogical correction if necessary);

● creating an educational environment when working with a group of children (taking into account the individual characteristics of children in group work);

● providing control over the solution of educational tasks, which allows for more complete and appropriate use of the methodological resources of the educational process, and at the same time monitors the development of children.

Monitoring the child's development is important in the activity of a pedagogue and is used and serves as a means of improving the quality of education of preschool children:

*** Determining the interests , needs and skills of each child .** Observations allow children to be motivated and fully meet their educational needs, identify each child's interests, skills and needs, what they prefer, what activities they choose when given the choice, and learn as individuals.

*** Giving the most appropriate assessment of the situation in the child's development.** Observation allows you to coordinate the opinions of adults who see this child differently, to confirm or reject their hypotheses.

*** Choosing the right pedagogical strategy .** Do not spend time on activities that children can do themselves. Maybe it's important that they do it at the level of quality that we want. It is also important to establish feedback to know the effectiveness (inefficiency) of your pedagogical efforts. As a result, it is possible to make the necessary changes to the plan, give a new color to the developing space of the group, work with the family, and draw up an individual work plan.

*** Identify processes that require attention . *Observations*** allow adults to see if the child has special needs that need to be met . These may include hearing, vision, musculoskeletal, and other developmental physical and mental issues. If they are detected, parents should be advised to contact specialists in time, for example, a speech therapist, a psychologist or a medical worker.

*** Determining how best to solve problematic situations.** Observations allow educators to learn to identify what behavior can be expected from a child in certain situations and thus help the child learn to manage his or her own behavior. Observations allow adults to determine which means should be used to prevent negative reactions and their consequences . *Understanding* the dynamics of a child's change and development as a result of time and education . Observations allow children to see how they are developing physically, socially, emotionally, cognitively and in their speech and communication skills throughout the year, which allows for timely help and support, as well as targeted planning of changes in conditions, forms and measures that meet children's individual needs. allows [5] .

Results and Discussion

Making changes to the learning environment. By observing how children use play spaces (such as development centers) and materials, educators can determine whether the materials meet the children's needs and whether additional materials are needed. Make changes to the schedule. With the help of observation, educators can determine the need to make changes to the curriculum

in accordance with the needs and individual characteristics of children. With the help of observations, educators can determine the need to change the content or form and methods of education so that the educational technology is suitable for all children in the group.

In short, teaching literacy in preschool educational organizations is a type of activity aimed at forming children's elementary reading and writing skills. Summarize information that can be used by parents or preschool education professionals. Working with parents, educators can help families learn more about their children, their strengths and weaknesses, and their special needs. This exchange of information creates true collaboration. Educators and parents can collaboratively apply the results, which can be used to help children understand and coordinate their actions. They can see how certain knowledge and skills acquired by children are acquired, interpreted and applied during 'direct learning activities' .

The effectiveness of his pedagogical actions *(or ineffective)* feedback to determine whether to have a professional, objective and reliable picture of a child's educational success. Reading literacy is a person's ability to understand and analyze written texts, to use their content to achieve their goals, to develop their knowledge and abilities, and to actively participate in social life .

Conclusion

The main task of teaching literacy to preschool children is to introduce children to sounds and letters, to form correct, expressive reading skills by teaching them their correct pronunciation. Also, enriching children's vocabulary, developing connected speech, forming a system of knowledge, developing the sense of hearing and perception is also important during literacy training. Because the success of a child's education in primary school largely depends on his knowledge of his mother tongue and how well his speech is developed.

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ETHICAL AND PEDAGOGICAL ASPECTS OF ARTIFICIAL INTELLIGENCE APPLICATION IN INCLUSION: THE BALANCE BETWEEN TECHNOLOGY AND HUMAN INTERACTION

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Abstract. *This research paper provides an extensive and multi-dimensional analysis of the integration of artificial intelligence (AI), neurotechnologies, and digital infrastructure into the modern inclusive educational environment. In the context of global digital transformation, the study examines the critical intersection between rapid technological progress and the preservation of fundamental humanistic values in pedagogy. Drawing on a wide range of academic sources-including the latest terminological dictionaries, international conference proceedings from 2026, and specialized studies on the spiritual-ethical aspects of neuro-pedagogology - the authors analyze how advanced tools such as real-time speech recognition, the Internet of Things (IoT), and adaptive machine learning interfaces facilitate learning for students with diverse special educational needs. The paper utilizes the rigorous IMRAD structure to detail the methodology of the research, the practical results of implementing digital tools across different categories of disabilities, and a critical discussion regarding the "digital divide" and ethical boundaries. A significant part of the research is dedicated to the "human factor" and the "sincerity principle," arguing that while AI can significantly reduce the labor intensity of educational tasks and automate technical adaptations, it is fundamentally incapable of replacing the emotional intelligence, empathy, and spiritual connection provided by a human teacher. The findings suggest a sustainable hybrid model of education where technology acts as a powerful cognitive assistant, but the pedagogical foundation remains rooted in sincere human interaction. This article is intended for educators, researchers, and students interested in the future of inclusive pedagogy in the age of high technology.*

Keywords: *inclusive pedagogy, artificial intelligence, spiritual and ethical aspects, children with special needs, digital transformation*.

INTRODUCTION

In the contemporary era of the Fourth Industrial Revolution, the global educational landscape is undergoing a profound and irreversible systemic shift, primarily driven by the accelerated integration of artificial intelligence (AI) and neurotechnologies into the fabric of learning. This transformation is particularly critical and sensitive within the field of inclusive education, which aims to provide equitable opportunities for learners with diverse physical and cognitive needs. According to the foundational definitions provided in the terminological dictionary by D. Z. Akhmetova and colleagues, inclusive education is not merely a logistical adjustment of the classroom but a fundamental social and pedagogical process designed to ensure

equal access to knowledge for all, scrupulously accounting for the vast diversity of special educational needs [6, p. 7]. In the present decade, this process has become inextricably linked with the phenomenon of digitalization. However, digitalization in this context goes far beyond the mere presence of hardware; it signifies a radical reconfiguration of pedagogical philosophy. As noted in the conceptual framework of A. P. Leonov, modern information technologies serve as a specialized complex of methods and instruments engineered specifically to reduce the cognitive and physical labor intensity required to process information resources [1, p. 142].

Despite the clear instrumental benefits of these advancements, recent academic discourse, particularly works by D. Z. Akhmetova and T. S. Artyukhina, highlights a growing tension between technological efficiency and humanistic values. The "points of contact" between digitalization and inclusion are found at the complex intersection of technical infrastructure and spiritual ethics [1, p. 143]. The primary scientific challenge is ensuring that the rapid "technological breakthrough" does not inadvertently lead to a "dehumanization" of the classroom. For students with special educational needs, the school experience is much more than a quest for data; it is a vital laboratory for social adaptation, psychological resilience, and emotional growth. Therefore, the primary objective of this research is to define the ethical and pedagogical boundaries of AI application, arguing that while algorithms can provide unprecedented support, they must never supplant the irreplaceable presence of a human mentor who provides the spiritual and emotional foundation necessary for true inclusion [2, p. 110].

MATERIALS AND METHODS

The methodology for this comprehensive five-page study is rooted in a multi-dimensional theoretical analysis of academic literature, longitudinal case studies, and materials from international scientific forums spanning the period from 2018 to 2026. The research material encompasses a diverse array of specialized sources. We began with the analysis of specialized glossaries to establish a consistent conceptual framework for inclusion and neuro-pedagogical technology [6]. Furthermore, we conducted a deep dive into socio-economic research concerning the "digital divide" and its impact on the social adaptation of persons with disabilities, particularly the findings of A. Ts. Choizhalanova regarding the integration of IoT and robotics [5]. A significant portion of the primary data was derived from the proceedings of the "Innova-2026" international conference, which focused specifically on digital transformation in the age of generative AI and the new roles of tutors in adaptive environments [4].

Additionally, we synthesized findings from recent neuro-pedagogical studies that examine the spiritual and ethical implications of using neurotechnologies as tools for cognitive enhancement, specifically focusing on the works of G. A. Stepanova and M. R. Arpentieva [2]. We also integrated technical assessments of software and hardware infrastructure from the research of Z. M. Kazova and L. M. Tsikanova, who detailed the features of applying digital tools in inclusive settings [3]. The comparative method was employed to evaluate the functional effectiveness of various AI-driven solutions against traditional pedagogical methods. This synthesis of multi-disciplinary experience allows for the formulation of a balanced hybrid model of inclusive interaction that prioritizes humanistic values alongside technological power.

RESULTS. The analysis of the global technological landscape reveals that Artificial Intelligence has evolved from a niche auxiliary tool into the primary transformative force within inclusive settings. One of the most significant results of this evolution is the development of compensatory technologies that effectively bridge the gap created by physical or sensory deficits. For instance, advanced speech recognition systems and real-time synthesis programs have reached

a level of accuracy that allows students with severe hearing impairments to participate in standard lectures by perceiving spoken words as instant text on their personal devices [4, p. 271]. Similarly, for students with visual impairments, AI-driven assistants now generate sophisticated "alt-text" descriptions and tactile-audio feedback for complex visual data, enabling them to construct mental models of charts, diagrams, and images that were previously entirely inaccessible [3, p. 52].

Furthermore, the implementation of adaptive learning platforms has revolutionized the concept of classroom personalization. These systems utilize machine learning algorithms to monitor a student's progress in real-time, identifying specific areas of struggle and automatically adjusting the curriculum's difficulty. If a student with a cognitive disability or a learning disorder like dyslexia encounters a barrier, the AI can immediately provide simplified linguistic explanations, visual infographics, or specialized "smart fonts" designed to improve readability and cognitive processing [3, p. 53]. This dynamic adjustment aligns perfectly with the "Universal Design for Learning" (UDL) principles, creating an environment where the infrastructure itself is flexible enough to accommodate any learner without constant manual intervention from the teacher [1, p. 145]. Beyond software, the role of the Internet of Things (IoT) and specialized robotics has expanded significantly in the 2025-2026 period. As documented by A. Ts. Choizhalanova, smart classroom sensors can now automatically regulate lighting, acoustics, and temperature to meet the sensory requirements of children with autism or sensory processing disorders, while telepresence robots provide a vital social bridge for students who are physically unable to attend school, allowing them to engage in peer interactions and group projects as if they were physically present [5, p. 192]. Finally, the results indicate a significant shift in the professional role of the educator. By delegating the labor-intensive tasks of technical adaptation and routine data tracking to AI systems, teachers are able to reclaim a substantial portion of their instructional time. The data suggests that in technology-integrated inclusive classrooms, educators can dedicate up to 30% more time to providing individualized emotional and psychological support, which is critical for students with special needs [4, p. 282].

DISCUSSION

While the technological achievements described above are undeniably impressive, they necessitate a rigorous discussion regarding their long-term pedagogical and ethical consequences. Many researchers, including G. A. Stepanova and colleagues, express concern that an over-reliance on neurotechnologies and AI could lead to a reductionist view of the student as a "biological machine" for information processing [2, p. 112]. The "spiritual-ethical" lens is crucial here; if a child's primary interaction is with a machine, the essential human connection—the "pedagogical love" and moral guidance that characterize traditional mentorship—is at risk of being lost. A machine, no matter how sophisticated its programming, cannot model the complex nuances of human integrity, conscience, and social responsibility. Another critical point of discussion is the persistent challenge of the "digital divide" and its socioeconomic implications. As A. Ts. Choizhalanova points out, technological progress is not distributed equally across all regions or social strata. There is a significant risk that students in lower-income regions or underfunded institutions will be left behind, creating a new form of "digital disability" where the lack of access to AI tools becomes a greater barrier than the student's original physical condition [5, p. 194]. Moreover, there is the phenomenon of "social atrophy." If technology becomes a crutch that replaces all human negotiation and social interaction, students may lose the ability to navigate the unpredictable and emotionally complex nature of real-world human environments [2, p. 115]. The most vital element of this discussion is what we term the "sincerity factor." Our research confirms

that for children with special educational needs, the emotional atmosphere of the classroom is the primary predictor of success. These students often possess a heightened sensitivity to the authenticity and emotional state of their mentors. They require validation, empathy, and a genuine sense of belonging that can only be provided by a person who truly cares. As highlighted in the proceedings of "Innova-2026," while an AI can be an excellent assistant for information retrieval and technical adaptation, it lacks the intuitive capacity to sense a child's silent distress or celebrate a small breakthrough with genuine joy [4, p. 350]. The emotional warmth of a human teacher is not just a "bonus" to the educational process; it is its very heart and soul, and its absence could lead to psychological isolation despite technical inclusion [2, p. 118].

CONCLUSION. In conclusion, the integration of Artificial Intelligence and digital infrastructure into inclusive pedagogy represents one of the most significant evolutions in the history of modern education. The evidence synthesized from our analysis across multiple academic sources demonstrates that tools such as AI, VR, IoT, and adaptive software are indispensable for dismantling the physical and cognitive barriers that have historically marginalized students with special educational needs. These technologies provide a level of personalization, accessibility, and professional efficiency that was previously unimaginable. However, as we move further into the digital age, we must firmly reject any model of education that prioritizes algorithmic efficiency over human connection. The most sustainable path forward is the adoption of a "Human-Centric Hybrid Model." In this framework, technology serves as the "cognitive assistant"—efficiently handling the logistics of accessibility, data analysis, and routine instruction. Meanwhile, the teacher must remain the "spiritual architect" and moral guide of the classroom, providing the emotional security and empathetic interaction that are fundamental to human development. True inclusion is achieved not when a student is merely provided with the best device, but when that device is used to facilitate deeper, more meaningful connections with the human community. Ultimately, pedagogical success in the age of AI will be measured not by the sophistication of our machines, but by our ability to preserve the "human" at the heart of the learning process, ensuring that every child feels valued, understood, and truly included

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THE ROLE OF NEUROPSYCHOLOGICAL METHODS IN SPEECH TERAPHY WORK

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Abstract. *The article is dedicated to analyzing the role of neuropsychological methods in speech therapy work with children with speech disorders. The relevance of the topic is due to the increasing number of children with various forms of speech pathology and the need to apply comprehensive scientifically-based approaches to their correction. In modern conditions, speech therapy is increasingly relying on the achievements of neuropsychology, which allows for a deeper understanding of the mechanisms of speech formation and the identification of the features of the functioning of higher mental functions in children with disabilities. The article examines the theoretical foundations of using neuropsychological methods in speech therapy, revealing their diagnostic and correctional capabilities. Special attention is paid to the neuropsychological approach developed in the works of domestic researchers, which allows us to consider speech disorders as a result of the underdevelopment or dysfunction of certain brain mechanisms. The application of neuropsychological diagnostics contributes to a more accurate determination of the defect structure, identification of weak and preserved links in the child's mental activity, which is an important basis for constructing an individual speech therapy correction program. The work also analyzes the main directions of using neuropsychological exercises in speech therapy practice, aimed at developing interhemispheric interaction, activity regulation, attention, memory, and motor functions closely related to speech development. It is emphasized that the integration of neuropsychological methods into the speech therapy system contributes to improving the effectiveness of correctional work, activating cognitive processes, and more successfully forming speech skills in children. In conclusion, it is noted that the application of neuropsychological methods in speech therapy practice is a promising direction for the development of modern correctional pedagogy and contributes to the comprehensive development of the child's personality.*

Keywords: *neuropsychology, speech therapy, higher mental functions, cognitive rehabilitation, interdisciplinary approach.*

INTRODUCTION

Modern speech therapy is developing in an active integration with neuropsychology, neurolinguistics, and clinical neurology. Speech disorders are considered as complex systemic disorders affecting the linguistic, cognitive, and regulatory spheres. The increasing number of children with disabilities, the increasing incidence of post-stroke speech disorders, and the need for personalized rehabilitation programs determine the relevance of the neuropsychological approach.

The theoretical basis is the cultural-historical theory of L.S. Vygotsky and the concept of systemic dynamic localization of higher mental functions by A.R. Luria. According to these provisions, speech is formed as a result of the interaction of various brain structures and social factors of development. A.R. Luria identified three functional blocks of the brain: the block for regulating tone and wakefulness, the block for receiving, processing, and storing information, and

the block for programming and monitoring activities. Speech disorders can be caused by dysfunction of any of these blocks. Damage to the temporal-parietal cortex leads to sensory forms of aphasia, while damage to the frontal structures leads to dynamic and motor speech disorders.

Modern neurovisualization studies confirm the participation of distributed neural networks in ensuring speech function. Frontal zones provide programming and control of speech activity, parietal-temporal - phonological and semantic processing, subcortical structures - automation of motor components of speech. In children's practice, neuropsychological analysis allows for the identification of immature regulatory mechanisms, impaired hemispheric interaction, and sensorimotor integration underlying alalia, dysarthria, and phonetic-phonemic disorders. Thus, the neuropsychological approach provides a systematic understanding of speech defect structure and determines the directions of correctional work.

METHODS

The methodological basis of the research is the analysis of scientific publications published between 2010 and 2025 that address the issues of neuropsychological diagnostics and speech rehabilitation in children with speech disorders. The study is based on contemporary theoretical and empirical works in the fields of neuropsychology, speech therapy, special pedagogy, and clinical psychology. Particular attention was given to studies examining the role of neuropsychological approaches in identifying the mechanisms of speech disorders and in developing effective rehabilitation strategies.

The research methodology includes a comprehensive review of scientific articles, monographs, conference proceedings, and clinical guidelines devoted to neuropsychological methods used in speech therapy practice. Sources were selected from peer-reviewed journals, scientific databases, and specialized publications in the fields of psychology, pedagogy, and speech pathology. The study employed a set of general scientific methods. The method of theoretical analysis was used to examine existing scientific concepts and approaches related to neuropsychological diagnostics and rehabilitation of speech disorders. The method of synthesis allowed for the integration of various theoretical positions and empirical findings in order to identify common patterns and methodological principles in the application of neuropsychological techniques in speech therapy.

In addition, the method of generalization of empirical research data was applied to summarize the results of previously conducted studies on the effectiveness of neuropsychological methods in speech correction and rehabilitation. Systematic analysis of clinical recommendations and methodological guidelines in the field of speech therapy and neuropsychology was also carried out. This made it possible to determine the most widely used diagnostic tools and rehabilitation techniques applied in contemporary speech therapy practice. The methodological framework of the study is based on the principles of interdisciplinarity, evidence-based practice, and a comprehensive approach to the study of speech disorders. These principles ensure the reliability of the research results and allow for a more holistic understanding of the role of neuropsychological methods in modern speech therapy work.

RESULTS

Modern research in the field of speech therapy and neuropsychology confirms the importance of an interdisciplinary approach to the diagnosis and correction of speech disorders. The neuropsychological approach, based on the works of A. R. Luria, considers speech as a complex functional system, the formation and functioning of which is ensured by the interaction of various brain structures (Luria, 2000). Speech disorders, according to this concept, can be

associated not only with defects in speech mechanisms but also with the underdevelopment or dysfunction of higher mental functions.

Analysis of scientific literature shows that the application of neuropsychological diagnostics significantly expands the possibilities of speech therapy practice. This approach allows for the identification of a primary defect, the determination of secondary impairments, and a comprehensive assessment of the state of cognitive functions, including attention, memory, praxis, gnosis, and performance control (Akhutina, Pylayeva, 2012). Neuropsychological diagnostics allows for the determination of the defect's structure and the identification of weak and preserved links of the functional speech system, which is of fundamental importance for constructing an effective correctional work program.

The use of neuropsychological tests contributes to more accurate differentiation of similar clinical conditions. In particular, such methods allow for the differentiation of motor alalia and dysarthria, as well as the identification of cognitive factors hindering successful assimilation of speech material. According to L. S. Tsvetkova, neuropsychological analysis of speech disorders allows for a deeper understanding of their occurrence mechanisms and determines the optimal ways to restore impaired functions. In recent years, significant attention has been paid to the application of neuropsychological methods in the neurorehabilitation system. Studies show that combining traditional speech therapy methods with cognitive training contributes to improving the effectiveness of speech function restoration, especially in aphasia (Kiran & Thompson, 2019). A comprehensive approach aimed at activating various cognitive processes, including memory, attention, and activity programming, contributes to improving speech activity and forming stable communication skills.

Furthermore, modern research demonstrates the prospects of using neuromodulation methods in the comprehensive rehabilitation of speech disorders. In particular, the use of Transcranial Direct Current Stimulation (tDCS) and transcranial magnetic stimulation (TMS) is considered as an additional tool that contributes to brain neuroplasticity and speeds up the restoration of speech functions (Hamilton et al., 2011). These methods are actively studied in clinical neuropsychology and neurorehabilitation and show positive results when combined with speech therapy sessions. Thus, the analysis of scientific sources indicates that neuropsychological methods play an important role in the diagnosis and correction of speech disorders. Their application allows for more accurate determination of the defect's structure, revealing the cognitive mechanisms of speech difficulties, and increasing the effectiveness of speech therapy work. The integration of neuropsychological approach into speech therapy practice is a promising direction for the development of modern correctional pedagogy and contributes to a more comprehensive development of the child's personality.

DISCUSSION

The obtained data confirm the necessity of including neuropsychological analysis in the structure of speech therapy diagnostics. Using this approach allows for a deeper investigation of the mechanisms of speech disorders and reveals the relationship between speech activity and the state of higher mental functions. The integration of information on the development of attention, memory, praxis, gnosis, and regulatory processes allows for a shift from predominantly symptomatic correction to systemic and comprehensive rehabilitation of speech disorders.

Neuropsychological analysis allows for the determination of the defect's structure, the establishment of leading and secondary disorders, and the identification of preserved links of mental activity that can serve as a support in correctional work. This approach ensures more

accurate planning of speech therapy impact and facilitates the individualization of corrective and developmental programs.

The neuropsychological approach is of particular importance when working with children with disabilities, in whom speech disorders are often combined with cognitive function deficits, disorders of voluntary regulation of activity, and motor coordination. Under these conditions, the integrated use of logopedic and neuropsychological methods allows for more effective stimulation of the development of a child's speech and cognitive activity. Applying a neuropsychological approach to the neurorehabilitation system for patients after stroke and other organic brain lesions is equally important. In such cases, speech disorders, including aphasia, are often accompanied by impairments in memory, attention, spatial perception, and motor functions. Comprehensive diagnostics and correction based on neuropsychology principles contribute to more complete restoration of speech functions and improvement of patients' communicative capabilities.

A promising direction for further research is the development of standardized protocols for interdisciplinary interaction between specialists - speech therapists, neuropsychologists, neurologists, and rehabilitation specialists. In addition, the implementation of digital technologies for neurocognitive assessment, allowing for the automation of diagnostics, increasing the accuracy of data analysis, and expanding the possibilities of monitoring the dynamics of speech and cognitive function recovery, has significant potential. Thus, the integration of neuropsychological methods into the system of speech therapy diagnostics and correction represents an important direction in the development of modern correctional pedagogy and neurorehabilitation.

CONCLUSION

Neuropsychological methods are an important component of modern speech therapy practice, as they allow specialists to better understand the complex mechanisms underlying speech disorders. Speech development is closely connected with the functioning of various brain structures responsible for perception, processing, and production of speech. Therefore, the application of neuropsychological approaches makes it possible not only to identify the external manifestations of speech impairments but also to determine their underlying neuropsychological causes. This significantly increases the accuracy and reliability of diagnostics and helps specialists choose more effective correctional strategies.

The use of neuropsychological methods in speech therapy practice contributes to a comprehensive assessment of cognitive functions such as attention, memory, thinking, and executive control, which are closely related to speech activity. Through specialized diagnostic tasks and tests, speech therapists and neuropsychologists can determine which brain functional systems are involved in the development of a particular speech disorder. This approach allows for a deeper analysis of speech pathology and provides a scientific basis for developing targeted intervention programs.

Another important advantage of neuropsychological diagnostics is the possibility of personalizing correctional and rehabilitation work. Since speech disorders may have different neuropsychological mechanisms in different children, individualized intervention becomes a crucial factor in achieving positive outcomes. Neuropsychological data help specialists design correctional programs that take into account the child’s cognitive profile, strengths, and specific difficulties. As a result, speech therapy interventions become more effective and better adapted to the individual needs of each child.

Furthermore, the integration of neuropsychological methods with traditional speech therapy techniques promotes a multidisciplinary approach to speech rehabilitation. Cooperation

between speech therapists, neuropsychologists, educators, and medical professionals allows for a more comprehensive understanding of speech disorders and improves the coordination of therapeutic interventions. Such integrated work is especially important in cases of complex developmental disorders, where speech difficulties are combined with other cognitive or neurological impairments.

Despite the significant progress in this field, further research is needed to improve the methodological foundations of neuropsychological diagnostics in speech therapy. In particular, it is important to develop standardized diagnostic protocols that would ensure the reliability and comparability of research results across different clinical and educational settings. In addition, there is a need for longitudinal studies aimed at evaluating the long-term effectiveness of integrated neuropsychological and speech therapy programs. Such research would contribute to the development of evidence-based practices and enhance the overall effectiveness of speech rehabilitation for children with speech disorders.

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METHODOLOGICAL FOUNDATIONS FOR IMPROVING STUDENTS' KINESTHETIC DEVELOPMENT DURING THEIR PREPARATION FOR PROFESSIONAL ACTIVITIES

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Abstract. *This article examines the importance of developing students' professional skills, motivation, professional development, and the use of innovative educational technologies in the modern education system. It analyzes the influence of psychological and pedagogical factors on the process of improving educational and methodological support in line with international requirements and the development of future specialists as well-rounded individuals. Special emphasis is placed on the role of motives, needs, internal incentives, and interests in professional development, as well as the readiness of young people to choose a profession.*

Keywords: *professional skills, motivation, innovative education, holistic personality development, educational technologies, psychological-pedagogical factors, career choice.*

Introduction

Education is recognized as a key factor in the modern international development system, ensuring sustainable development in our century. At the international education forum in the Republic of Korea, the importance of "creating opportunities for quality education throughout life" was emphasized within the framework of the Vision 2030 framework. This, in turn, has expanded the opportunities for developing educational and methodological support for the professional training of future teachers using educational technologies aimed at developing students' professional skills, organizing their professional and practical training based on an innovative approach, and fostering independent thinking, creativity, and ingenuity.

With the informatization of the global education system, research is underway to update educational and methodological support for developing the professional skills of future professionals in line with international requirements, as well as to clarify the psychological and pedagogical factors in developing students' professional skills. In addressing these challenges, the development of methodological resources for the development of professional skills and their improvement based on an innovative approach, the creation of the necessary pedagogical conditions, and the use of modern educational technologies to improve the quality and effectiveness of education are relevant.

Main part

One of the key areas of educational reforms implemented in our country is the development of each representative of the younger generation as a comprehensively developed, educated, and, undoubtedly, harmonious individual. Naturally, a harmonious individual is understood as the upbringing of a spiritually mature individual who cares about the history, present, and future of their homeland and is eager to contribute to the development of society, which resonates with the demands of today. An analytical approach to this concept reveals how multifaceted and complex it is, and how comprehensively it aligns with universal human values. It can be said that this implies the development of a harmonious individual, their mastery of a worthy profession, their worthy

contribution to the development of society, and, through this, self-awareness and self-realization in society—in short, the development of a comprehensively mature individual.

The pursuit of excellence is a complex, holistic process that occurs simultaneously with professional development and continues practically throughout life. More precisely, professional development is understood as a person receiving an education in a certain professional field in accordance with his mental abilities, physical capabilities, predisposition to a particular field, interests and aspirations, as well as values and worldview, with subsequent entry and adaptation in this field and, finally, becoming a mature and qualified specialist over many years.[1, p. 53]

The initial and most important stage of professional development encompasses the period of choosing a future profession, that is, the time before making a specific professional decision. It is well known that in the continuing education system for ninth-grade students and graduates of general secondary education, the eve of graduation is a time filled with youthful feelings and passions, when they strive to realize their future dreams and hopes. In ontogenesis, this period is characterized by such features as the acquisition of civil status by young people entering independent life, as well as the formation of their personal, social, and spiritual views and beliefs. Therefore, it is precisely during this time that the responsibility of authorized persons should increase to help young people set the right goals at the threshold of life and subsequently move forward confidently and boldly.

As is well known, motives are a source of inner strength, impelling a person to act to achieve a specific goal. Motives manifest themselves in the process of human activity as specific needs and are satisfied through its implementation. Motives for human activity have various forms and structures, for example: organic, functional, material, social, spiritual, and so on. It is also necessary to enhance an individual's academic motivation by fostering a positive attitude toward their chosen profession. It is well known that one of the socially conditioned human qualities is personal direction, or motivation. Motivation is an important psychological process within the personality structure, directing all actions toward a common and unified goal, stimulating and fully ensuring its stable functioning. Motives, needs and interests, inclinations and desires, and internal stimuli constitute the core of motivation. [3, p. 12]

A person’s abilities or professional skills are formed and developed depending on their “environment” (the environment can also hinder their development). “Environment” refers to the family, preschool, school, lyceum, college, higher education institution, work team, and microsociety (friends, acquaintances, etc.). In other words, a skill originates in a person’s “inner world” as a hereditary, biological ability or inclination based on interest. By its nature, it is a subjective quality that is formed and developed depending on objective conditions. Skill encompasses not only intellect but also affective behavior, abilities, and intrinsic motivation. Intrinsic motivation determines an individual's values and, according to the scientist, is crucial in skill development. [2, p. 26]

Research results and discussion

Clearly, the concept of motivation, unlike the concept of motive, represents a broader psychological process aimed at achieving long-term goals and implementing long-term plans. Motivation, which develops within the personality structure in relation to professional skills, is a socially conditioned component and develops through education and upbringing. Based on the methods analyzed above, it should be noted that the primary goals of modern research should be: helping young people find their place in society, striving to earn the respect and recognition of others, proving their capabilities to themselves and others, further strengthening their faith in their

destiny and the future of their homeland, and, most importantly, further developing their professional skills. It is only natural that, in a context of dramatic change, reforms, and a shifting status of values, the attitudes of today's youth toward the future cannot leave anyone indifferent.

Conclusion

Thus, the essence, purpose, and content of education are determined by the level of cultural development of a society, its scientific and technological progress, the degree of implementation of industrial technologies, as well as the development of students' professional skills and their practical application. Depending on social relations, the demand and need for general education, the level of students' professional preparation, and their views on education, the essence, purpose, content, forms of organization, methods, and means of implementing education change and improve at different periods (stages) of society's development.

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PSYCHOCORRECTION OF THE FUNCTIONAL STATE OF THE BRAIN IN PRIMARY SCHOOL PUPILS BASED ON AN ERGONOMIC APPROACH

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Abstract. *This article analyzes the issues of psycho-correction of the functional state of the brain in primary school pupils based on an ergonomic approach. The study examines the influence of ergonomic conditions of the educational environment on pupils' cognitive activity, attention stability, and psychophysiological state. During the research process, methods such as pedagogical observation, diagnostic analysis, interviews, and comparative analysis were employed. The results of the experimental study demonstrate that psycho-correctional activities organized on the basis of an ergonomic approach have a positive impact on the development of pupils' attention, memory, and learning activity.*

Keywords: *neuro-pedagogy, ergonomics, psycho-correction, functional state of the brain, cognitive activity, primary school age, attention, psychophysiology.*

Introduction

In the modern educational system, ensuring the intellectual and psychological development of pupils is considered one of the key pedagogical tasks. In particular, the brain activity and psychophysiological development of primary school pupils are among the main factors determining the effectiveness of education. At this stage of development, pupils' nervous systems are actively maturing, and cognitive processes such as attention, memory, thinking, and perception continue to develop. The improper organization of the educational process, excessive workload, and failure to comply with hygienic and ergonomic requirements of the classroom environment may lead to fatigue, decreased attention, and psychological stress among pupils. Therefore, organizing the educational process on the basis of an ergonomic approach and applying psych correctional methods has become one of the most pressing scientific issues.

An ergonomic approach is aimed at adapting the learning environment to human physiological and psychological capabilities, thereby supporting pupils' brain activity. From this perspective, psych correction of the functional state of the brain in primary school pupils, in harmony with ergonomic conditions, is of significant scientific and practical importance. The study of the functional state of primary school pupils remains one of the fundamental problems at the intersection of neuropsychology, pedagogy, and ergonomics. Modern research indicates that the effectiveness of the learning process is directly dependent on the stability of the brain's bioelectrical activity.

Literature review.

Neuropsychological approach: Fundamental ideas concerning the systemic organization of brain activity were proposed by A.R. Luria (1973), who identified three functional blocks of the brain. In particular, the energetic block (thalamus and reticular formation) is considered a key factor determining cognitive endurance in primary school children. According to V.B. Chelpanov

(2003), providing psychological support to pupils in the educational environment should include not only pedagogical guidance but also the rehabilitation of the functional state of the brain.

Minimal Brain Dysfunction (MBD) and cognitive analysis: At the international level, R.A. Barkley (2006) and other researchers have analyzed Attention Deficit Hyperactivity Disorder (ADHD) and MBD from a neurophysiological perspective, demonstrating that children with these conditions exhibit an imbalance between excitation and inhibition processes in the cerebral cortex. In his didactic studies, P.F. Kapterev (2003) pointed out that the discrepancy between a child's physical and psychological capacities may lead to "didactogeny" (stress caused by the teacher).

Ergonomic and technological approach: The psychophysiological aspects of ergonomics were explored by V.P. Zinchenko and V.M. Munipov (1989) within the framework of the "Human–Machine–Environment" system. Today, this approach has been adapted to education, leading to the development of the concept of "pedagogical ergonomics." The methodology of transcranial electrostimulation (TES), developed by V.P. Lebedev (2001), is recognized as one of the most effective non-medical methods for ensuring emotional stability in pupils by activating the brain's endogenous opioid system.

Research methodology

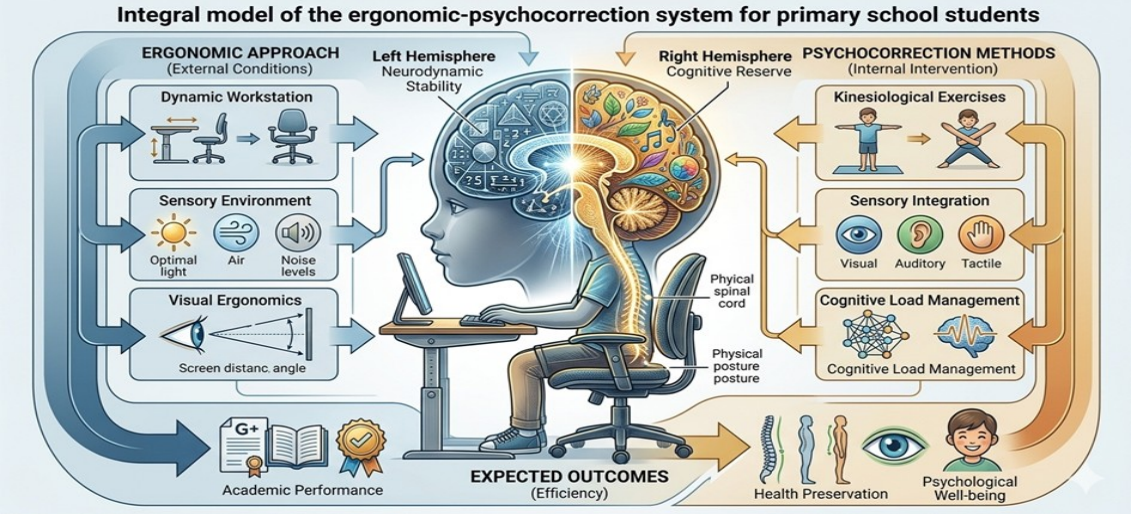
During the research process, scientific sources in the fields of pedagogy, psychology, and neuro-pedagogy were analyzed. In order to study pupils' psychophysiological state and determine the impact of ergonomic conditions of the educational environment, a range of scientific methods was employed. The study applied the following set of methods: analysis of scientific and pedagogical literature, pedagogical observation, diagnostic psychological methods, questionnaires and interviews, comparative and systematic analysis, as well as statistical generalization of the obtained results.

Figure 1. Human psyche and its cognitive processes



The figure illustrates the human psyche and its cognitive processes based on complex and logical symmetry. The left hemisphere is represented by abstract shapes, formulas, mathematical equations, and linguistic symbols, reflecting logic, analytical thinking, and speech functions. The right hemisphere is depicted through bright colors, natural elements (such as trees and flowers), musical notes, and creative imagery, symbolizing imagination, emotions, and intuition. The cognitive networks and light waves connecting both hemispheres represent integrated brain activity and cognitive flexibility. In addition, the figure also reflects sensory integration and the close interaction between the individual and the surrounding environment.

Figure 2. Ergonomic and psycho-correctional system for optimizing the functional state of the brain in primary school pupils.



The conceptual model of the ergonomic and psycho-correctional approach (Figure 2) demonstrates that the ergonomic environment (physical comfort, proper posture, and sensory conditions) creates a favorable foundation for the child's brain activity. Psycho-correctional exercises implemented on this basis (such as neuro-acrobatics and sensory integration) contribute to maximizing cognitive reserve. As a result, along with an increase in learning efficiency, the child's physical and psychological well-being is maintained.

Table 1.

Ergonomic Factors of the Educational Environment

No.	*Ergonomic factors*	*Impact*
1	Classroom lighting	Reduces visual strain
2	Desk and chair height	Ensures proper sitting posture
3	Active breaks	Stimulates cerebral blood circulation
4	Visual materials	Enhances perception and memory
5	Psychogymnastic exercises	Promotes proper sitting posture

These methods made it possible to examine pupils' cognitive processes as well as the functional indicators of brain activity.

Conceptual model of the ergonomic and psycho-correctional approach.

ERGONOMIC ENVIRONMENT
workplace design, physical comfort,
appropriateness of technical equipment

↓

PSYCHOLOGICAL DIAGNOSTICS
stress level, emotional state,
individual characteristics

↓

PSYCHOCORRECTIONAL METHODS
training sessions, relaxation techniques, cognitive methods,
psychological counseling

↓

MOTIVATION AND EMOTIONAL SUPPORT
social environment, communication,
psychological support



RESULT: EFFICIENCY AND WELL-BEING
work productivity, stress reduction,
psychological stability

Experimental study. Within the framework of the study, experimental work was conducted with the participation of primary school pupils. The experimental procedures were aimed at determining pupils' psychophysiological state and evaluating the effectiveness of psycho-correctional activities organized on the basis of an ergonomic approach. The experiment was carried out in three stages.

At the initial stage, pupils' attention stability, memory processes, and overall psychological activity were examined. In addition, observations were made regarding classroom lighting, pupils' sitting posture, the suitability of desks and chairs, and the organization of breaks during the learning process.

Table 2.

Results of the diagnosis of pupils' functional brain state (initial stage)

No.	Indicators	Low level (%)	Medium level (%)	High level (%)
1	Attention stability	42	38	20
2	Short-term memory	35	44	21
3	Psychological activity	39	41	20
4	Motivation for learning	33	46	21

Note: The table results indicate that students' attention and levels of mental activity are not sufficiently developed.

In the second stage, a system of psychocorrectional exercises based on an ergonomic approach was developed. These sessions were aimed at activating students' attention, reducing psychological stress, and supporting cognitive activity.

The training sessions were organized in the following areas:

- short movement breaks;
- exercises developing visual-motor coordination;
- cognitive tasks enhancing attention;
- elements of psycho-gymnastics.

At the final stage, a comparative analysis of students' initial and final indicators was conducted. The results showed significant positive changes in students' attention stability and learning activity.

Table 3

Results of diagnosing the functional state of students' brain (final stage)

No.	**Indicators**	**Low level %**	**Medium level %**	**High level %**
1	Attention stability	21	43	36
2	Short-term memory	19	47	34
3	Psychological activity	18	45	37
4	Motivation for learning activity	16	48	36

Note: It was observed that the training sessions organized based on an ergonomic approach had a positive impact on students' cognitive activity.

Results and Discussion

The results of the study confirmed that an educational environment organized on the basis of an ergonomic approach has a positive effect on students' psychophysiological state. During the experiment, an increase in students' attention stability, a decrease in fatigue levels, and a rise in interest in learning activities were observed. Additionally, it was found that psych correctional exercises integrated with ergonomic conditions contribute to the activation of students' brain activity. This, in turn, highlights the importance of applying neuro-pedagogical approaches in the educational process. The research results indicate that psych correction of the functional state of the brain in primary school students based on an ergonomic approach is one of the most effective directions in modern pedagogy. We discuss the obtained results from the following pedagogical perspective:

After applying the tools in the experimental group, students' attention stability improved significantly. As educators, we emphasize that attention is the "gateway" to learning. If a child's brain energy resources are weak (as in cases of Minimal Brain Dysfunction – MBD), they tend to stop processing information in the second half of the lesson. The effectiveness achieved through our methodology suggests that we have expanded the child's "psychophysiological endurance threshold." This allows teachers to explain even the more complex parts of a lesson towards its end.

The discussion also shows that problems in a child's emotional sphere often arise from an imbalance in the brain's biophysical processes. Rather than simply encouraging a child to "study well," we enhanced their natural motivation for learning by increasing endorphin levels (through ergonomic means) in the brain. The model we propose does not reject traditional pedagogy; rather, it complements it. If the classroom meets ergonomic requirements in terms of physical conditions (lighting, color, noise level), and if students periodically undergo short-term instrumental correction, the effectiveness of education increases naturally. This ensures the stability of the "Human–Educational Tool–Environment" system.

Practical Recommendations

Based on the research results and the effectiveness of the ergonomic approach, the following practical recommendations are proposed for education system specialists:

1. To establish not only standard school psychology rooms, but also "Pedagogical Ergonomics" centers equipped with modern devices (TES-therapy equipment, color-impulse devices; see Figure 3). This will help reduce students' fatigue during lessons (see Figure 4).
2. When designing class schedules, to take into account the dynamics of brain energy resources in primary school children. The most difficult subjects (mathematics, native language) should be scheduled at times when brain activity is at its peak (usually during the 2nd–3rd lessons).
3. Teachers should interpret students' poor academic performance not as "laziness," but as a "disruption of the brain's functional state" (Minimal Brain Dysfunction – MBD), and provide such students with individualized ergonomic workloads.
4. During lessons, to apply short-term (2–3 minute) visual and acoustic ergonomic exercises (working with colors, relaxation music) that help stabilize the brain's alpha rhythm.
5. At home, to organize the child's study environment (lighting, color scheme, and break cycles) in accordance with the correctional programs implemented at school. It is also

important to continuously monitor the child's emotional state and sleep quality, as these are key indicators of the recovery of the brain's functional state.

6. To include courses such as "Educational Ergonomics" and "Fundamentals of Neuropedagogy" in bachelor's and master's programs in pedagogy. This will help future teachers understand children's brain activity from physical and biological perspectives.

Figure 3. TES Therapy Device (Transcranial Electrical Stimulation)



Figure 4. Ergonomic Sensory Room Equipment for Schools



Conclusion

Our study has demonstrated that a teacher should not be limited solely to humanitarian (traditional pedagogical) methods in their professional activity. The integration of achievements from physics and neurophysiology (such as TES and EEG monitoring) into the pedagogical process represents the highest form of a "learner-centered" approach in teaching primary school children. According to the research findings, psych correction of the functional state of the brain in primary school students based on an ergonomic approach is an important factor in increasing the effectiveness of education. An educational environment organized in accordance with ergonomic requirements helps ensure students' psychological well-being and supports the development of their cognitive activity. Therefore, it is advisable to widely implement ergonomic approaches and psych correctional methods in primary education practice.

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ANALYSIS OF PEDAGOGICAL AND PSYCHOLOGICAL FACTORS IN THE GRAPHIC SCIENCES STUDY PROCESS IN HIGHER EDUCATION INSTITUTIONS

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Abstract. *This article examines the teaching process of graphic disciplines in higher education institutions, focusing on pedagogical and psychological factors that influence participants in the educational process, as well as the interdependence of these factors. The role and importance of these factors in the curriculum and their impact on students during the learning process are identified, including how these pedagogical and psychological factors affect students when transitioning between subjects. Furthermore, based on scientific research, the article highlights the key aspects of the aforementioned pedagogical and psychological factors in the development of spatial imagination and spatial thinking, which play an essential role in mastering graphic sciences among students.*

Keywords: *academic modules, psychological process, family environment, pedagogical factors.*

Introduction

It is well known that several factors influence a student's mastery of academic modules, namely pedagogical and psychological factors. These factors manifest in specific ways in both teachers and students. For the effective perception of pedagogical factors, it is important to prepare the student psychologically. This is because the learning process becomes effective only when the student is psychologically ready for it [1,2].

The psychological factors observed in students are reflected in the following:

1. Physical readiness for class, meaning that the student is well-rested (in some cases, students come to class very tired due to work, which leads to a loss of interest in listening to and mastering the lesson);
2. Ability to concentrate attention, which is a psychological process where, at the beginning of the learning process, a student is unable to focus on the lesson. This is manifested through distraction. The main reasons include lack of interest in the subject, family conditions, dependence on mobile phones, the internet, social networks, and others;
3. Interpersonal relationships among group members, where situations such as belittling active students or mocking those who express their opinions may occur;
4. Emotional state within the family environment, including the quality of relationships between the student and family members. An unhealthy environment can hinder the student's ability to adapt and succeed in the learning process;
5. Interest in the chosen field, meaning that when a profession is chosen under pressure from parents or others, it results in a lack of genuine interest. Beginning the learning process without clear purpose leads to ineffective learning outcomes.

Along with the psychological factors mentioned above, pedagogical factors also play an important role in students. The pedagogical factors observed in students during the learning process are reflected in the following:

1. The student's interest in the subject — as a pedagogical factor, this is a condition that arises on the basis of psychological factors such as lack of interest in the chosen field and choosing a field under parental pressure.
2. The importance of prior knowledge — if the knowledge acquired by the student at school is insufficient, the lack of a basic foundation in university subjects leads to misunderstanding of the subject. This, in turn, results in a lack of interest in the subject and consequently a decrease in the level of mastery [3,4].
3. The level of mastering academic modules — if sufficient conditions for study are not created for the student by parents, this is explained by the influence of the above-mentioned psychological factors (attention, family environment, lack of interest in the chosen field). In addition, the pedagogical and psychological factors of the teacher also have an impact here.
4. The role of spatial imagination — this is important in mastering graphic disciplines and is a phenomenon that occurs subconsciously during the process of reading drawings. The development of spatial imagination serves to increase the level of mastering graphic subjects.
5. The level of mastering academic modules — the lack of sufficient conditions created by parents for the student's education is explained by the influence of the above-mentioned psychological factors (attention, family environment, lack of interest in the chosen field). In addition, the pedagogical and psychological factors of the teacher also have an impact here.
6. The role of spatial imagination — it is important in mastering graphic disciplines and is a phenomenon that occurs subconsciously during the process of reading drawings. The development of spatial imagination contributes to improving the level of mastering graphic subjects.
7. The level of mastering academic modules — the lack of sufficient conditions provided by parents for the student's education is explained by the influence of the above-mentioned psychological factors (attention, family environment, lack of interest in the chosen field). In addition, the pedagogical and psychological factors of the teacher also have an impact here [5,6].
8. The role of spatial imagination — it is important in mastering graphic disciplines and is a phenomenon that occurs subconsciously during the process of reading drawings. The development of spatial imagination helps to improve the level of mastering graphic sciences.
9. Level of mastering academic modules — if sufficient conditions for studying are not provided by parents, this can be explained by the influence of the above-mentioned psychological factors (attention, family environment, lack of interest in the chosen field). In addition, the pedagogical and psychological factors related to the teacher also have an impact here.
10. The role of spatial imagination — this is important in mastering graphic disciplines and is a phenomenon that occurs subconsciously during the process of reading drawings. The development of spatial imagination contributes to improving students' performance in graphic subjects.
11. The importance of graphic thinking — as a result of the development of spatial imagination in students, graphic thinking is formed. In this process, the student performs stages such as analyzing drawings, applying them in practice, and drawing conclusions, which

correspond to the levels of Bloom's taxonomy. This prepares the student for creative activity. Figure 1.

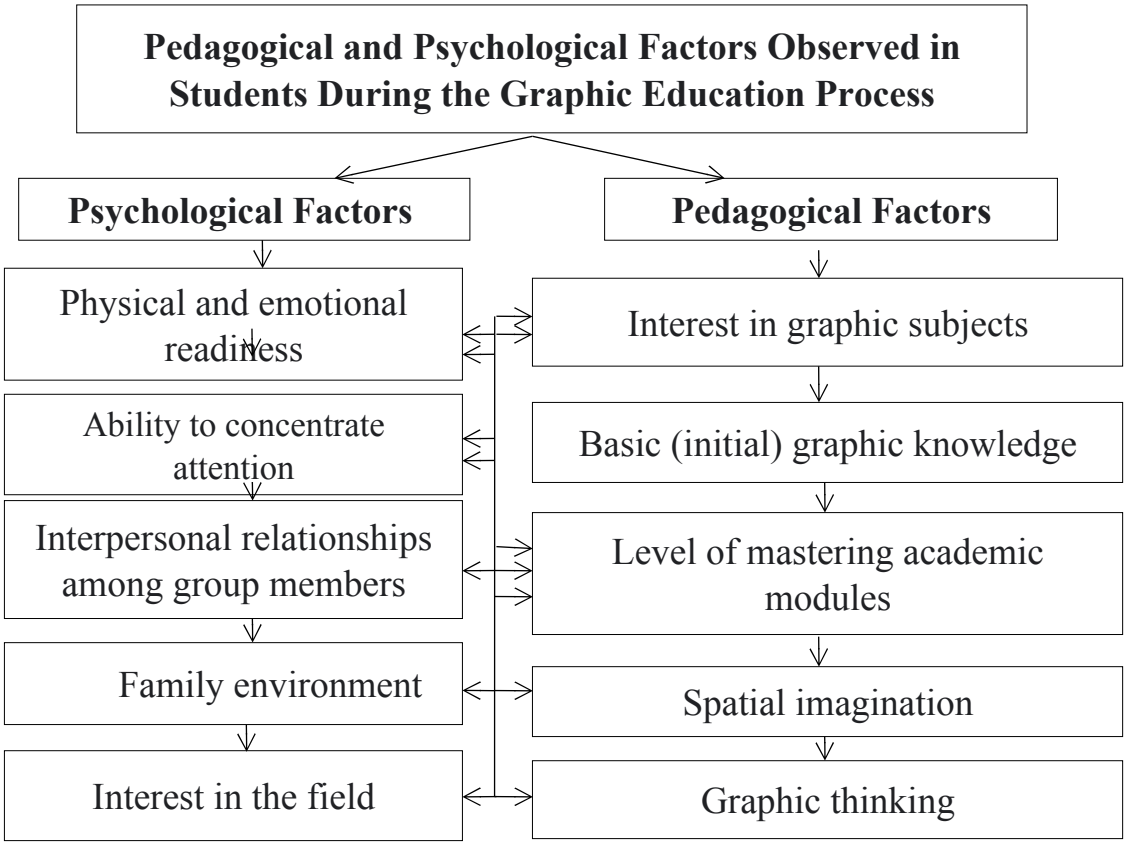


Figure 1. Pedagogical and Psychological Factors Observed in Students During the Graphic Education Process

If we analyze these psychological and pedagogical factors, we can see that when a student comes to class without physical fatigue, a skilled teacher can engage the student in the subject through appropriate teaching methods. This helps the student develop concentration, reinforces basic graphic knowledge, and fosters independent learning skills. As a result, it increases the level of mastery of academic modules.

Interpersonal relationships among group members are also one of the factors that influence how effectively a teacher can manage the classroom during the lesson. Although such situations occur rarely, if relationships among group members are not positive, it becomes difficult for the teacher to manage the classroom. A supportive family environment, where parents provide proper conditions and serve as positive role models, leads to better learning outcomes. Interest in the chosen field is also an important factor. If a student has chosen a field under someone else's pressure, it becomes the teacher's responsibility to engage the student, spark interest in the field, and help them become a competent specialist by applying their professional skills.

Psychological factors observed in teachers are manifested in the following:

1. The teacher's psychological and physical readiness for the lesson — if the teacher is in a good mood and comes to class well-prepared, the lesson begins in a positive and uplifting atmosphere.

2. Self-control during the lesson — during the lesson, situations may arise where a student interferes with the teacher's ability to manage the classroom. In such cases, the teacher must demonstrate professional pedagogical skills and handle the situation appropriately.

3. Openness and transparency in interpersonal relationships — during the lesson, the teacher should interact with students based on pedagogical ethics, maintain fairness throughout the teaching process, and ensure openness and transparency. This helps to form positive attitudes toward the teacher among students.

4. The ability to resolve problematic situations wisely — for example, when a student attempts to disrupt the classroom environment, the teacher should be able to manage and resolve the situation effectively and rationally.

5. Inability to properly evaluate a student's inappropriate behavior based on pedagogical ethics and encountering conflict situations during the lesson — in such cases, the teacher should be tolerant toward the student and help them understand that their behavior is incorrect. Methods such as warning, giving examples, or gentle correction can be used. If these methods do not yield results, the teacher should work individually with such students.

Pedagogical factors observed in teachers during the lesson:

1. The teacher's pedagogical mastery — pedagogical mastery is an essential factor required from a teacher to engage the audience during the lesson. It possesses such strength that it can elevate any group of students to the desired level or, conversely, lead to ineffective outcomes.

If a teacher has sufficient knowledge but lacks pedagogical mastery, the functions of classroom management and control will not operate effectively. This may result in a lower level of effectiveness in achieving the intended learning objectives, even among students who are interested and capable.

Insufficient subject knowledge of the teacher — this occurs in some cases when a teacher is not specialized in the field or has not mastered the subject thoroughly for various reasons. As a result, they may face numerous difficulties in their professional activity. It is advisable for such teachers to work within their area of specialization.

1. Insufficient subject knowledge of the teacher (this occurs in some cases, meaning that the teacher may not be a specialist in the field or, for various reasons, may not have fully mastered their subject area. As a result, they encounter numerous difficulties in their professional activity. It is advisable for such teachers to work within their area of specialization).

2. Improper organization of the learning process (in this case, due to the teacher's inability to properly allocate time during the lesson, they fail to achieve the learning objectives. For example, failure to correctly organize and allocate time for stages such as taking attendance, reviewing previous material, explaining new content, and assessing students' understanding leads to low effectiveness in achieving educational goals).

3. Development of professional competencies in the learning process (the teacher prepares students for practical and real work processes related to their field during the lesson) [7].

4. Improper organization of the learning process (similarly, when the teacher does not properly structure and allocate time for different stages of the lesson—such as attendance, revision, explanation, and assessment—the effectiveness of achieving learning objectives decreases).

5. Development of professional competencies in the learning process (the teacher prepares students for practical and real-life professional activities within their field during the lesson).

6. Linking the learning process with the field and real-life practical situations (by connecting the learning process with real-life and professional situations, it is possible to increase students' interest in the subject, help them fully understand the importance of the topic being studied, and develop skills such as independent learning and creative activity. This is because

students realize that they can achieve results by solving real practical problems that are important for their future professional activity). Figure 2.

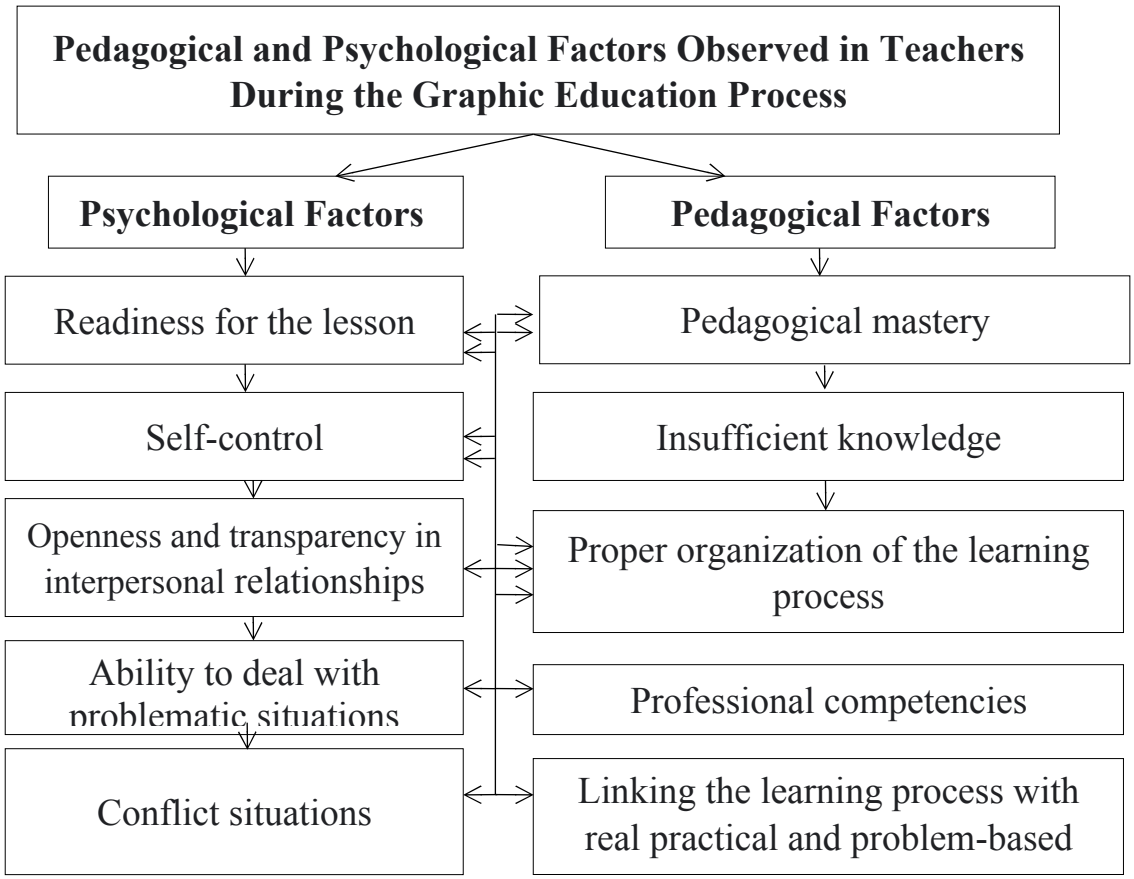


Figure 2. Pedagogical and Psychological Factors Observed in Teachers During the Graphic Education Process

Conclusion

The pedagogical and psychological factors discussed above are directly interconnected processes and act as complementary elements that determine whether the educational process is effective or ineffective. Maintaining a balance between students' psychological and pedagogical factors largely depends on the pedagogical and psychological factors of the teacher. As an example, in the educational process of graphic disciplines, the figures presented above illustrate the pedagogical and psychological factors required from both teachers and students to maintain this balance.

To develop these factors, it is highly important and relevant to use innovative pedagogical approaches and modern digital technologies in the educational process and to integrate them into teaching practice. Therefore, in our scientific research, it is necessary to implement the integration of specialization subjects and graphic disciplines in order to improve students' mastery of graphic sciences and to help them understand their importance in the professional field. This, in turn, contributes to increasing students' interest in graphic subjects. Moreover, the pedagogical and psychological factors mentioned above positively influence the development of the educational process. In this context, teaching the integration of topics from graphic disciplines and specialization subjects through virtual reality technologies provides students with the opportunity to perform practical tasks through visual perception, observation, and experiential learning.

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ORGANIZATION OF AN EXPERIMENTAL STUDY WITH CHILDREN AGED 5-7 WITH AUTISM SPECTRUM DISORDER

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Abstract. *The organization of experimental and quasi-experimental work with children aged 5–7 years with autism spectrum disorders places special demands on the researcher: the phenomenon under study is variable in its manifestations, and indicators of speech and communication depend substantially on interaction conditions, motivation, sensory load, and the characteristics of the adult conducting the sessions. This article presents a model for conducting experimental work in a preschool setting or a corrective and developmental center, aimed at obtaining comparable and verifiable data while maintaining pedagogical relevance and the ethical acceptability of intervention. The rationale and structure of the ascertaining, formative, and control stages are described; requirements for participant selection and baseline characterization are substantiated; and a diagnostic minimum is proposed that combines standardized observation with functional measurements of communication in naturalistic situations. Particular attention is paid to the formative stage as the core of the experiment: the principles for designing the intervention protocol are specified, along with parameters of intensity and procedural repetition, fidelity monitoring, and measures to ensure reliability in data recording and interpretation, including inter-rater agreement and rules for handling missing data. It is shown that methodologically sound experimental work makes it possible to distinguish the effect of pedagogical influence from situational fluctuations in behavior and to present results in a format suitable for professional discussion within an interdisciplinary team and for planning an individualized developmental pathway for the child.*

Keywords: *autism spectrum disorders; preschool age; experimental work; pedagogical experiment; early intervention; communication; functional assessment; intervention protocol; data reliability; procedural fidelity monitoring.*

Introduction

It is important to suggest that in scientific and applied literature, autism spectrum disorders (ASD) are viewed as a group of neurodevelopmental conditions characterized by persistent difficulties in social interaction and communication combined with restricted, repetitive patterns of behavior and interests. In preschool age, these characteristics are manifested primarily in the atypical development of joint attention, reduced selectivity to social signals, difficulties in using speech as a means of regulating interaction, and variability in responses to an adult's обращение. At the same time, the speech abilities of children aged 5–7 with ASD are often distributed across a wide range: from the absence of extended oral speech to seemingly intact phrasal speech which, however, may be insufficiently functional, situational, or pragmatically limited. As a result, assessing the effectiveness of corrective and developmental interventions requires reliance not on a

general level of "speech development," but on specific, observable, and reproducibly measurable manifestations of communication related to the child's everyday tasks in the educational environment.

Certainly, the concept of "experimental and practical work" in special education and speech therapy is appropriately interpreted as a type of pedagogical experiment in which a targeted intervention is created and changes in predetermined indicators are recorded while controlling conditions that influence the outcome. This approach fundamentally differs from descriptive observation, as it involves not only the registration of the initial state but also the organization of procedures that make it possible to establish a relationship between the intervention and observed changes. In pedagogy, experimentation is traditionally associated with the need for operationalization: abstract categories such as "communicative development" or "formation of communication skills" must be translated into a system of indicators that can be observed, counted, and compared over time. For preschool children with ASD, this methodological principle is especially significant, since behavior and communication are subject to rapid fluctuations, and without strict procedures it is easy to mistake a situational increase in activity or a well-chosen motivation for a stable program effect.

Definitely, the theoretical foundation for organizing the experiment is provided by views on the activity-based nature of development and the leading role of communication and joint activity in the formation of higher mental functions. In the context of ASD, the question of how mechanisms of social mediation are constructed comes to the fore: a child may demonstrate preserved individual cognitive operations while experiencing difficulties in initiating contact, coordinating attention with another person, and understanding the communicative meaning of interaction. Therefore, the logic of intervention is usually aimed not only at "adding" linguistic units, but also at expanding the functions of communication: requesting, refusing, commenting, requesting information, attracting attention, and participating in joint play. In this regard, it is methodologically justified to include functional assessment of communication in situations close to natural ones within experimental and practical work, since it is under such conditions that the applied value of the skill is revealed and the transfer beyond the therapy room can be verified.

Along with measurement validity, reliability of data and reproducibility of procedures become of key importance in studies involving children with ASD. Reliability is ensured through uniform rules of registration, inter-rater agreement in coding, as well as control of adherence to the intervention protocol, which in contemporary methodology is often described through the concept of fidelity. Practically, fidelity reflects the extent to which sessions actually correspond to the declared technology: whether the structure of interaction, prompting methods and their fading, reinforcement principles, and parameters of load and pace of presentation are observed. Thus, the introduction of procedures for data quality control and protocol adherence into experimental and practical work is not an additional formality, but a necessary condition for the scientific validity of results in a situation where the object of study is characterized by high heterogeneity and sensitivity to environmental factors.

Main part.

It should be noted that experimental and practical work with children aged 5-7 with ASD in pedagogy and speech therapy is justified when its goal is formulated as testing the effectiveness of a specific method of intervention and when measurable indicators are defined in advance, allowing differentiation between dynamics associated with the intervention and natural age-related changes or situational fluctuations. In preschool age, this condition becomes particularly important: the

same speech manifestations may intensify or weaken depending on the daily routine, level of fatigue, sensory environment, characteristics of the adult, as well as on how well the child understands the structure of the session and accepts the rules of interaction. Consequently, an experiment in this field cannot be reduced to a "series of sessions" followed by a description of impressions; it must be organized as a reproducible procedure in which comparability of conditions and transparency of the protocol serve not as formalities, but as the basis of evidence.

Moreover, the structure of experimental and practical work is traditionally built on a sequence of ascertaining, formative, and control stages. At the ascertaining stage, the initial level of communication and speech development is recorded, and features of social interaction, behavior regulation, and play behavior are clarified, since these parameters determine accessibility to learning and the child's sensitivity to pedagogical interventions. Substantively, the ascertaining stage should include not only a characterization of the "level of speech," but also a description of communication functions that is, what the child uses available means of communication for, in which situations they initiate contact, which methods they prefer, and which conditions provoke refusal or disorganization. Such a formulation of the task establishes a link between diagnosis and intervention: what is measured is not an abstract quality, but those components of communication that can become targets in the formative program.

What is more important, participant selection in experimental and practical work should be carried out on the basis of a set of criteria that ensure the interpretability of the results. The age range of 5–7 years defines the general level of requirements; however, within this range there may be significant differences in the level of comprehension of addressed speech, the presence of phrasal speech, the development of joint attention, and the ability to remain engaged in joint activity. Therefore, the description of the sample should be based on data on the functional level of communication, as well as on information about comorbid limitations which do not automatically exclude a child but must be recorded as factors influencing developmental dynamics. Diagnostic confirmation of ASD and a description of the clinical profile establish a framework for comparison and allow behavioral and communicative features to be correctly interpreted within the context of international classifications; however, in a pedagogical experiment the key factor remains not the nosological label, but the operationalization of observable indicators that can be reliably recorded and analyzed.

Besides that, the diagnostic minimum at the ascertaining stage should address two objectives: to provide a comparable characterization of ASD manifestations under assessment conditions and, at the same time, to describe the child's communication in situations close to everyday life. In practice, this is achieved by combining standardized observation with functional behavior recording. The standardized component, including procedures such as ADOS-2, makes it possible to describe the level of social interaction, the quality of communication, and speech characteristics within an organized series of tasks, which is important for comparability of data across children and across stages of the study. At the same time, standardized assessment reflects the child's behavior in a specific diagnostic situation and is therefore insufficient for evaluating how communication is used in real educational routines. For this reason, the protocol includes observations and tasks that model typical preschool situations: requesting an object, participating in joint play, following a short instruction, transitioning between activities, waiting for one's turn, and seeking help. It is in these contexts that functional indicators usually most sensitive to intervention are recorded: the frequency of initiations, the number of functional requests, the

quality of responses to adult prompts, the stability of joint attention, as well as manifestations of echolalia and their communicative role, if this issue is addressed in the study.

Transition to the formative stage is possible only after measurable variables have been defined and the conditions for their registration have been specified. Indicators must be formulated in such a way that different specialists record the same phenomenon in the same way. This requires defining the unit of observation (e.g., a "communicative attempt," "episode of addressing," or "utterance") and specifying which behaviors are counted as target manifestations and which are not. Equally important is establishing the temporal format of data collection: session duration, distribution of observations across days of the week, conditions of implementation, the set of materials used, and the sequence of task presentation. Otherwise, observed dynamics may reflect changes in conditions rather than the effects of the pedagogical program.

Substantively, the formative stage involves the implementation of an intervention protocol that must be described in sufficient detail to ensure reproducibility. In contemporary evidence-based approaches to teaching preschool children with ASD, naturalistic developmental behavioral interventions (NDBI) are widely used, combining the structured nature of behavioral instruction with a developmental logic of interaction embedded in play and daily routines. For experimental and practical work, this is advantageous because the intervention does not remove the child from natural activity while simultaneously creating conditions for systematic teaching. In such protocols, rules for organizing the environment, methods of creating motivation, types of prompts and procedures for their fading, and the type of reinforcement predominantly natural, where the outcome of communication is access to a desired action, object, or social effect are specified. If alternative communication systems, such as PECS, are included in the program, the technology must be described with reference to its stages and transition criteria, since this staged structure ensures comparability of results and reduces the risk of arbitrary "simplification" of the method.

A specific methodological task of the formative stage is monitoring adherence to the intervention technology. In pedagogical experiments involving children with ASD, the influence of the practitioner's personality and situational factors is so substantial that without fidelity control it is impossible to confidently attribute observed effects to the intervention itself. Fidelity monitoring is implemented through a checklist of key session components, completed for each session or for a sampled set of sessions. The checklist typically includes parameters critical to effectiveness: preparation of materials and the environment, the presence of a clear structure, the use of visual supports, when necessary, the appropriateness of prompts and their gradual fading, alignment of reinforcement with the target behavior, and the quality of data recording. Such methodological discipline enhances the robustness of the experiment and increases the reliability of the conclusions.

Alongside fidelity, inter-rater verification of data recording contributes significantly to ensuring reliability. A portion of video recordings or protocols is coded by a second specialist according to the same rules, after which inter-rater agreement is calculated. This step is often perceived as "redundant"; however, in studies where the object of analysis consists of communicative behaviors and subtle distinctions between response and initiation, inter-rater agreement effectively becomes a criterion of measurement quality. Separate regulations are required for missed or disrupted sessions, which for preschool children with ASD are not exceptions but an expected occurrence. A properly designed protocol specifies the conditions under which data are considered valid: the minimum number of observations, acceptable reasons

for absence, conditions for rescheduling sessions, as well as methods for marking and accounting for missing measurements in the analysis.

The control stage is intended to confirm that the observed dynamics pertain to the target indicators and are maintained outside the context of direct instruction. Therefore, the final assessment should include repetition of the diagnostic minimum under comparable conditions, as well as evaluation of skill generalization to new materials, situations, and adults. In preschool age, generalization has not only scientific but also practical significance: if a skill is demonstrated only in the therapy room and only with one specialist, its effect can hardly be considered pedagogically meaningful. In properly organized work, criteria of outcome significance link quantitative changes to qualitative transformations reflecting communicative functionality, such as the emergence of initiation, expansion of communicative functions, reduction of prompt dependence, and increased stability of interaction.

The final results of experimental and practical work within this model are expressed not through declarative statements about "improved development," but through the presentation of dynamics on operationalized indicators under demonstrably comparable conditions. The practical effect of such an organization typically manifests in reduced discrepancies between specialists' evaluations of the child and in increased manageability of the individualized program, since goals are derived from measurable difficulties and change is tracked using measures sensitive to intervention. In addition, the structured nature of the study facilitates collaboration with families: parents can be informed not only about the general direction of the work, but also about which specific changes are expected, the timeframe in which they may emerge, and the indicators by which they can be monitored in home routines.

Conclusion.

Experimental and practical work with children aged 5–7 with autism spectrum disorders in preschool settings or corrective-developmental centers requires an organization in which research logic does not replace pedagogical appropriateness, but rather makes corrective practice testable and reproducible. The specificity of ASD lies in the high heterogeneity of manifestations and the pronounced dependence of behavior and communication on the interaction context. Therefore, intervention outcomes cannot be interpreted without considering the conditions under which sessions were conducted, the stability of stimulus presentation, the manner in which the child's attention was organized, the motivational tools used, and the ways in which the adult either supported or unintentionally constrained the child's initiative. Expanding the concluding stage of the study is associated not so much with increasing the volume of text as with documenting those methodological conditions that ensure the validity of conclusions and allow the findings to be discussed within the professional community.

Above all, the effectiveness of experimental and practical work is determined by the quality of indicator operationalization. When the focus of analysis is placed on specific communicative actions and their functions requesting, refusing, commenting, seeking help, initiating joint activity, maintaining dialogue—it becomes possible to accurately compare baseline and outcome levels, track dynamics across stages, and identify stable changes rather than short-term "bursts" of activity. This approach reduces the risk of methodological error in which an external increase in speech output is mistakenly interpreted as communicative progress, while the functional orientation of communication remains limited and skill generalization to everyday routines does not occur. Consequently, the significance of results should be considered across two interrelated dimensions: quantitative shifts in predefined indicators and qualitative transformations in the

structure of interaction, including initiative, addressee orientation, flexibility in the use of communicative means, and the child's ability to regulate joint activity through speech or alternative modalities.

An important condition for the scientific rigor of the study is intervention reproducibility, achieved through detailed protocoling of the formative stage. In practical work, the formative stage is most often the most vulnerable: in the absence of clear rules for conducting sessions, different specialists implement the "same" program differently, making it impossible to attribute effects to the technology itself. Fidelity monitoring functions here as a system-forming mechanism. It allows changes resulting from the application of specific methods to be distinguished from the influence of the specialist's individual style, randomly selected stimuli, or situational success of a particular session. Inter-rater verification of data recording belongs in the same methodological framework: when part of the material is coded by an independent specialist using unified rules, data reliability increases and interpretive subjectivity decreases—especially in cases where distinguishing between response and initiation, or between echolalic repetition and functional utterance, requires fine-grained differentiation.

Special attention in the final conclusions should be given to the issue of generalization and maintenance of acquired skills. For preschool children with ASD, pedagogical significance lies not only in achieving a target indicator within individual sessions, but also in the child's ability to apply the acquired communicative strategy in other contexts—within the group, at home, and in interactions with different adults and peers. For this reason, the control stage should be viewed not as a formal "reassessment," but as a test of whether observed progress is maintained when materials, interaction partners, and activity structure change. If generalization is not observed, this may indicate insufficient work on the generalization phase, a mismatch between selected goals and the child's current capacities, or inadequate involvement of the family and educational environment in supporting new skills. Accordingly, the conclusions of experimental and practical work should reflect not only the presence or absence of an effect, but also its nature: contextual dependence, stability, conditions of strengthening and weakening, and the limits of applicability of the intervention.

From a practical perspective, the presented approach to organizing experimental and practical work makes it possible to address several tasks simultaneously. First, it ensures the evidential validity of the corrective program and makes results comparable across children and observation periods, thereby increasing the manageability of the individualized educational pathway. Second, it establishes a shared language for describing developmental dynamics within an interdisciplinary team, where speech therapists, special educators, psychologists, and teachers require aligned observation criteria and unified indicators of progress. Third, it creates a foundation for constructive interaction with parents, as it enables well-grounded discussion not only of "what was done during sessions," but also of which specific changes are expected, how they are monitored, and which conditions at home and in the group support skill generalization.

Thus, the expanded conclusion highlights a key position: experimental and practical work with preschool children with ASD becomes scientifically and practically meaningful when it is grounded in measurable indicators of functional communication, implemented through a reproducible protocol with fidelity control, and includes verification of skill transfer to natural contexts. When these conditions are met, the study allows not only for substantiating the effectiveness of selected methods, but also for refining intervention parameters, identifying factors that constrain progress, and developing recommendations applicable in real educational practice.

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TRANSFORMATION OF BACHELOR'S DEGREE PROGRAMS IN THE TRANSPORT SECTOR IN THE CONTEXT OF THE SUSTAINABLE MOBILITY CONCEPT (CASE OF UZBEKISTAN)

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Abstract. *This article examines the theoretical and methodological foundations for the transformation of bachelor's degree programs in the transport field in the context of the transition to sustainable development. The necessity of integrating the principles of sustainable mobility into the structure of professional training for future specialists in the transport sector is substantiated. A structural and content-based model for the modernization of educational programs has been developed, including interdisciplinary integration, project-based learning, and the use of digital modeling tools. Practical examples of implementing updated modules in higher education institutions of Uzbekistan are presented.*

Keywords: *sustainable mobility, transport education, bachelor's degree, modernization of educational programs, competency-based approach, digital technologies, Uzbekistan.*

INTRODUCTION

The current stage of development of the transport sector is characterized by increasing environmental requirements, the digitalization of infrastructure, and the need to improve energy efficiency. In the Republic of Uzbekistan, large-scale programs for the modernization of the transport system are being implemented, including the development of electric transport, logistics hubs, and intelligent transport systems. Under these conditions, the demand for specialists with competencies in sustainable transport planning and management is growing. An analysis of existing bachelor's degree programs in the transport field shows that issues of sustainable mobility are integrated into curricula in a fragmented manner. This necessitates the development of a scientifically grounded model for transforming the content of professional training.

The aim of the study is to develop and substantiate a model for transforming bachelor's degree programs in the transport field within the framework of the sustainable mobility concept.

Research objectives:

1. To analyze the theoretical foundations of sustainable mobility within the higher education system.
2. To assess the degree of integration of sustainable development principles into existing educational programs.
3. To develop a structural and content-based model for program modernization.
4. To conduct an empirical validation of the proposed model.

MATERIALS AND METHODS

The methodological foundation of the study is based on systemic and competency-based approaches. The research employs methods of scientific literature analysis, curriculum mapping, comparative analysis, surveys, and statistical data processing. At the first stage, a systematic

analysis of publications on sustainable mobility and the modernization of transport education was conducted. At the second stage, curriculum mapping was carried out for several universities in Uzbekistan, including Tashkent State Transport University and regional technical universities. The present study is based on a mixed research design combining qualitative and comparative-analytical methods.

The methodology includes:

1. A systematic review of scientific literature on sustainable mobility and the transformation of engineering education;
2. Analysis of regulatory and strategic documents of the Republic of Uzbekistan;
3. Comparative analysis of international educational practices;
4. A case study of a specialized transport university;
5. An expert survey of representatives from academic and industry communities.

The theoretical framework of the study includes:

- the concept of sustainable mobility developed within the policies of the OECD and the International Transport Forum;
- the Education for Sustainable Development (ESD) competency framework proposed by UNESCO.

The study is applied in nature and is aimed at developing a model for transforming bachelor's degree programs in the transport field in Uzbekistan. National and international strategic documents were analyzed, including:

- strategic programs for the development of the transport system of the Republic of Uzbekistan;
- analytical reports of the World Bank;
- UNECE recommendations on sustainable transport;
- materials of the International Transport Forum on urban mobility development.

Tashkent State Transport University was selected as the empirical base as the leading specialized higher education institution in the transport field.

The analysis included:

- current bachelor's curricula;
- lists of academic disciplines;
- descriptions of learning outcomes;
- documents related to program modernization.

The following methods of analysis were applied in the study:

1. Content analysis of regulatory documents and curricula;
2. Gap analysis — comparison of existing learning outcomes with sustainable mobility competencies (based on the ESD framework);
3. Comparative analysis of international educational models;
4. Thematic coding (thematic analysis) of interviews;
5. Structural modeling of the curriculum aimed at developing an updated architecture of the bachelor's program.

To systematize the data, comparison matrices of the type "competency – discipline – learning outcome" were used. The reliability of the study was ensured through:

- data triangulation (scientific sources + strategic documents + expert evaluations);

- interdisciplinary alignment of theoretical frameworks;
- expert validation of the developed competency model;
- comparison of national and international practices.

Methodological contribution of the study. The proposed research design makes it possible to:

- integrate the theory of sustainable mobility with higher education reform;
- adapt international competency models to the national context;
- develop a practice-oriented model for transforming bachelor's programs in the transport field.

RESULTS

The analysis of curricula showed that elements of sustainable development are mainly represented in отдельных environmentally oriented disciplines and do not form a comprehensive training system. As part of the model implementation, the courses "Sustainable Urban Mobility" and "Environmental Assessment of Transport Systems" were introduced into the educational process. In addition, project-based learning was expanded through the use of digital modeling of transport flows in the cities of Tashkent and Samarkand.

The analysis of strategic documents of Uzbekistan revealed the following trends:

- modernization of transport infrastructure;
- improvement of energy efficiency;
- development of urban mobility;
- digitalization of transport systems.

Recommendations of UNECE and the International Transport Forum emphasize the need to transition to sustainable urban transport systems. However, in the national educational standards for bachelor's programs in the transport field:

- the term "sustainable mobility" is absent;
- climate-related competencies are not identified;
- carbon footprint assessment skills are not formalized;
- digital transport technologies are insufficiently represented.

A regulatory imbalance is observed between transport policy and the educational training of specialists. As part of the case study of Tashkent State Transport University, an analysis of bachelor's curricula in the transport field was conducted. Disciplines directly related to sustainable mobility are absent as independent modules. A comparison of learning outcomes with the ESD framework revealed the following:

Competency	**Level of Integration**
Systems thinking	Medium
Climate literacy	Low
Life cycle assessment	Low
Digital transport technologies	Medium
Interdisciplinary communication	Low

The key gap lies in the lack of integration of environmental and climate-related aspects into engineering disciplines. The curriculum is predominantly oriented toward the traditional model of

transport engineering. The professional community confirms the need for reform of educational programs. Based on the analysis, a transformation model has been developed, which includes:

1. Introduction of the core module “Sustainable Mobility and Climate Policy”;
2. Integration of the avoid–shift–improve principle into профильные disciplines;
3. Inclusion of courses on ITS, smart mobility, and big data;
4. Implementation of project-based learning;
5. Development of the module “Life Cycle Assessment in Transport Systems.”

The proposed structure предусматривает redistribution of the academic workload:

- engineering block — 50%;
- digital block — 20%;
- sustainability and ecology — 15%;
- management and policy — 15%.

The integration of sustainable mobility principles requires a transition from a disciplinary to an interdisciplinary training model. The case of Uzbekistan confirms the findings of international studies on the need to “green” engineering programs, while also highlighting specific institutional constraints of a transition economy. Key scientific results of the study:

1. A regulatory and competency gap between transport policy and the educational system has been identified;
2. The first structured gap analysis of bachelor’s programs in the transport field in Uzbekistan has been conducted;
3. An applied model for curriculum transformation has been developed;
4. Support for reforms from the professional community has been confirmed.

DISCUSSION

The obtained results indicate the need for comprehensive modernization of educational programs in line with international trends in sustainable development. The introduction of interdisciplinary modules and digital tools enhances the practical orientation of training and contributes to the development of environmental responsibility. The practical experience of universities in Uzbekistan demonstrates the possibility of integrating sustainable mobility principles into existing curricula without fundamentally altering the structure of educational standards. This study was aimed at analyzing the transformation of bachelor’s degree programs in the transport field within the framework of the sustainable mobility concept, using Uzbekistan as a case study.

The analysis of the national context of Uzbekistan showed that strategic documents declare a transition to a sustainable transport system, the digitalization of infrastructure, and the reduction of environmental impact. However, the results of the case study of Tashkent State Transport University revealed an institutional and competency gap between transport policy and existing bachelor’s educational programs. Key findings of the study:

1. Curricula largely retain a traditional engineering and technical structure;
2. Environmental and climate-related aspects are presented in a fragmented manner;
3. Digital technologies for sustainable mobility are insufficiently integrated;
4. The professional community confirms the need for program reform.

Thus, the transformation of educational programs is not only an academic task but also a strategic condition for the implementation of national transport policy and the achievement of sustainable development goals. The study contributes to the scientific discourse in the following areas:

- integration of the sustainable mobility concept and the ESD model into engineering education;
- adaptation of international competency frameworks to the national context of a transition economy;
- development of an applied model for the modernization of bachelor's programs in the transport field.

CONCLUSION

The transformation of bachelor's degree programs in the transport field in Uzbekistan is not merely a direction of educational reform, but a systemic prerequisite for ensuring the transition of the national transport system to a sustainable development model. The results of the study confirm that the existing model of training specialists, which is predominantly based on traditional engineering approaches, does not fully meet the modern requirements associated with climate challenges, digital transformation, and the growing complexity of transport systems. In this regard, the integration of the sustainable mobility concept into higher education becomes a strategic priority.

The developed structural and content-based model of program transformation ensures:

- the formation of interdisciplinary competencies combining engineering, environmental, digital, and managerial knowledge;
- the alignment of educational outcomes with international frameworks, including the Education for Sustainable Development (ESD) model;
- the strengthening of practice-oriented training through project-based learning and digital modeling tools;
- the integration of climate-oriented and lifecycle-based approaches into engineering education.

An important scientific result of the study is the substantiation of the necessity to overcome the regulatory and competency gap between national transport policy and the higher education system. Bridging this gap will allow for the synchronization of кадрового обеспечения with the strategic priorities of the transport sector.

From a practical perspective, the proposed model can serve as:

- a methodological basis for updating national educational standards;
- a tool for designing new bachelor's curricula in transport universities;
- a framework for integrating digital and sustainable technologies into the educational process;
- a guideline for strengthening cooperation between universities, industry, and government institutions.

The implementation of the proposed approach will contribute to the formation of a new generation of transport specialists capable of:

- designing sustainable urban mobility systems;
- applying digital technologies in transport planning;
- assessing environmental impacts and carbon footprint;
- making informed decisions in conditions of uncertainty and rapid technological change.

At the same time, the study has identified several limitations that open directions for further research. In particular, there is a need for:

- quantitative assessment of the effectiveness of the implemented educational modules;
- expansion of the empirical base to include multiple universities;
- development of tools for monitoring the formation of sustainability competencies;
- deeper integration of international academic partnerships.

In conclusion, the transformation of transport education in Uzbekistan should be considered as part of a broader process of socio-economic modernization and the achievement of sustainable development goals. The proposed model demonstrates the possibility of adapting global concepts of sustainable mobility to the national context while preserving institutional flexibility. Its implementation can become an important step toward increasing the competitiveness of national higher education and ensuring the sustainable future of the country's transport system.

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PLANTING A TREE IS PLANTING HOPE FOR THE FUTURE

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Abstract. *This article discusses the ecological, economic and social importance of tree planting. The article highlights the role of trees in environmental protection, air purification, soil fertility and combating climate change. It also examines the importance of tree planting for human health, the well-being of society and as a legacy for future generations. The article calls on everyone to plant trees and offers the opportunity to plant hope for the future through this process.*
Keywords: *ecology, economics, methodology, dialectics, nature, green space, environment, education, water, atmosphere.*

INTRODUCTION

In recent years, expressions such as “Green Space”, “Green Belt” have become increasingly common in our social life. One of the organizational measures to form and improve ecological culture is the implementation of the “Green Space” project. The essence of the “Green Space” – Green Belt Movement is as follows:

*Protecting nature through planting trees, i.e. restoring forests, reducing soil erosion, preserving water sources, and combating desertification;

*Regulating the balance of O2 and SO2 cycles through planting and caring for trees;

In 1977, Wangari Maatai founded the “Green Belt” organization. The main tasks of this organization are:

1. Planting trees, protecting the environment and combating desertification;

2. Women's rights: Providing rural women with the opportunity to earn an income by planting trees;

3. Explaining to people the connection between ecology and democracy.

Wangari Maathai's philosophy is very simple: "If we protect the environment. The environment will protect us." Her contribution to social philosophy: she was one of the first people to link environmental problems with peace and democracy, because the struggle for resources (natural resources - water, land, forests, etc.) often causes wars. Protecting nature means preventing war. "Planting a tree means planting hope for the future," Maathai says. Wangari Maathai was awarded the Nobel Peace Prize in 2004. This 64-year-old zoologist and conservationist, as the leader of the "Golden Belt" movement, planted more than 30 million trees in Africa over 10 years. Wangari Maathai was awarded the Nobel Peace Prize in 2004. "I know that this award is not just for me, but for hundreds of people in my country who are fighting against deforestation," said Wangari Maathai. "There are wars in the world and thousands of people are dying. I am grateful that there are so many people who are working against this atrocity."

METHODOLOLOGY

The first African Nobel laureate, Wangari Maathai, was honored by all participants. After all, the possibility that a selfless woman who has served so incredibly for good will try to create a forest in the waterless deserts of Africa may have caused some to laugh at first. However, her hard

work in the cause of good was not in vain. King Harald V of Norway solemnly presented her with the highest award in the world. Wangari Maathai died in 2011, and after her death, the Great Green Wall project in Africa gained momentum.

In her speeches, she often told the parable of the little hummingbird. When the forest is on fire, all the animals run away, but the smallest hummingbird carries water in its beak and tries to put out the fire. Maathai says: “I, like that hummingbird, do the best I can.” Today, the Green Belt movement he founded is considered a model for environmental activism not only in Kenya, but throughout the world. In Uzbekistan, the Ministry of Ecology, together with the Ministry of Higher Education, Science and Innovations, the Ministry of Preschool and School Education, the Association of Mahallas of Uzbekistan, the Agency for Youth Affairs, the Council of Ministers of the Republic of Karakalpakstan, regional and Tashkent city khokimiyats, have been implementing the following annually since 2025:

1. The republican eco-championship “New tree - new breath” within the framework of the national project “Green Space” among different segments of the population, students and schoolchildren;

2. Once a month, they organize campaigns and promotional events under the slogans “We will turn the neighborhood into a waste-free area” and “Create a green space in the neighborhood”.

Within the framework of the national project "Green Space", the greening of the territory of each country and republic is carried out - for example, in Uzbekistan, at least 200 million trees are planted annually, their germination is monitored through aerobiological monitoring in 10 areas that should be established on a republican scale, and Uzbekistan is to achieve the status of a green country; it is planned to increase the level of greening of Tashkent by 30%. It is also necessary to popularize this event in other cities and villages of our republic. In each city and district center, it is necessary to organize "public parks" for 50-100 thousand inhabitants.

One of the current parts of the nationwide "Green Space" project is the creation of an additional 500,000 hectares of green spaces on the dried-up bottom of the Aral Sea, bringing their total size to 2.5 million hectares, or 78% of the area, by the end of 2026. The bioecological essence of the national project "Green Space" is that it embodies a number of natural laws, and it is also emphasized that the violation of these laws is under strict state control. The bioecological essence of the national project "Green Space" reflects the following:

Firstly, it includes the ecological balance between the plant world and the animal world; (This balance is often about 4:1);

Secondly, the average amount of oxygen in the atmosphere on a global scale has decreased (from the natural-ecological norm);

Thirdly, protecting land from erosion; preserving the humus layer of the soil;

Fourthly, increasing the forest fund - thereby maintaining the balance between primary and secondary natural ecosystems. It includes activities to expand forest areas in the territories of Uzbekistan, find factors for the effective use of the forest fund, and protect and preserve forests.

1. Prevent the extinction of the republic's gene pool. Each plant, bird, and creature is unique, a part of a single chain that performs a certain function in the necessary interdependence of nature. Bees pollinate flowers, and plants produce fruits after pollination. The diverse interconnectedness of nature forms the invisible material foundation of the economy.

2. Study the problems of sanitary protection of 51 surface natural water bodies (i.e. rivers, small rivers, and natural lakes - S.Kh.) and secondary water bodies existing in the republic, and plan work in this regard;

3. Increase the efficiency of state ecological expertise to determine the compliance or non-compliance of economic and other activities operating in the territory of the republic with environmental requirements; Bring cooperation in Central Asia to a new - qualitative level in the field of preserving natural quality indicators of the environment, preventing environmental pollution and protecting nature;

4. In order to preserve the health of the population, to foresee the impact of each seedling, fruit tree, shrub planted in the territories of the republic on the health of the population, to pay strict attention to the ecological purity of all products grown. In this regard, the establishment of perimeter groves is envisaged to protect irrigated lands from erosion and to protect land reclamation facilities from sand drift.

RESULTS

Green Chemistry is a scientific direction aimed at reducing or completely eliminating the harmful effects of chemical agents that do not negatively affect the natural (biological, geological, chemical-M.A.) processes of the biosphere, do not have a negative impact on the environment, living organisms, or in the design of previously existing and produced chemical products and processes. Green chemistry was formed in the 1990s. Simply put, green chemistry is the safest way to make the chemical industry, in the words of chemists, “the art of making chemistry safe.” Green chemistry is not about cleaning up waste, but about preventing its formation in the first place. Green chemistry is not a set of discoveries related only to chemistry, but also a large, vast philosophy and a unique philosophical dialectical approach. This is how it should be understood. Scientific sources describe green chemistry as based on 12 basic principles. The 12 principles of green chemistry were developed by Paul Anatas and John Warner in 1998. The most important of them are:

1. Waste prevention: It is more beneficial to prevent waste from being generated than to clean it up later.

2. Atom economy: As much of the raw material as possible should be converted into the final product.

3. Safe synthesis: The use of substances in chemical processes that are not toxic to human health and the environment.

4. Renewable raw materials: The use of plant waste and other renewable sources instead of depleting resources such as oil;

5. Energy efficiency: Chemical reactions should be carried out at room temperature and normal pressure whenever possible.

6. Catalysis. Catalysts speed up reactions but are not wasteful.

7. Biodegradation, etc.

Green chemistry is not a single discovery, but a unique philosophical approach to universal problems, maintaining the chemical safety of the biosphere, so the Nobel Committee has repeatedly awarded scientists who have contributed to the development of this field. The main laureates associated with the direction of green chemistry are:

1. Wangari Maathai (1940-2011) - Kenyan public figure, ecologist, the first African woman to be awarded the Nobel Peace Prize in 2004, for planting trees in the African deserts.

2. 2005 Metathesis method - the most famous "green" award - Yves Chauvin (France), Robert Grubbs and Richard Schrock (USA) received the award for developing an effective method of chemical synthesis.

Why “green”? This method allows chemical reactions to be carried out with less energy consumption and a sharp reduction in toxic emissions. In its statement, the Nobel Committee called it “a giant step for green chemistry.”

1. 2021: Organocatalysts Benjamin List (Germany) and David Macmillan (USA) were awarded for their discovery of a new and safer way to build molecules - asymmetric organocatalysis.

2. Why green? Previously, toxic and precious metals were used as catalysts. These scientists taught the use of simple, cheap and environmentally friendly organic substances.

3. 2018. The evolution of enzymes Francis Arnold (USA) was awarded for his method of creating enzymes - enzymes in the laboratory through “directed evolution”. Francis Arnold received environmentally friendly, efficient and adapted enzymes. The enzymes he created are used in the following areas - in the production of biofuels; environmentally friendly chemical reactions; pharmaceutical products; enzymes in the food industry; widely used in bioplastics and biodegradation processes.

4. Why green? The enzymes he created can be used instead of toxic metals and allow reactions to be carried out in water (without hazardous solvents). This has made the production of medicines and biofuels much cleaner.

What positive changes are being made in the green chemistry industry in Uzbekistan? - a natural question arises?

DISCUSSION

In the late 1980s, Uzbek intellectuals, doctors, and public activists spoke out against the “cotton monopoly” and the excessive use of chemicals (more precisely, cases of “mass poisoning” due to the use of butifos dozens or hundreds of times more than the norm). As a result of these efforts, in March 1987, the State Sanitary Supervision of the USSR Ministry of Health issued a decree completely banning the use of butifos (a highly toxic organophosphorus substance used for cotton defoliation) in agriculture. However, it should be noted that even after 40-45 years, the damage caused by the disaster to nature has not disappeared one hundred percent. Negative effects of Butifos on health:

1. Negative effects on the nervous system. It paralyzes the cholinesterase enzyme, disrupting the transmission of signals through nerve fibers. This causes constant headaches, fatigue, memory loss, and irritability.

2. Reproductive health, that is, it sharply increases the risk of miscarriage and birth defects in babies.

3. Internal organs: It causes chronic diseases of the liver - hepatitis, kidneys, and gastrointestinal systems. Butifos causes great harm not only to the human body, but also to other ecocomponents - inanimate (soil, water, air) and living fauna. Although butifos quickly decomposes under open sunlight and in hot weather. Butifos, which has fallen into the deep layers of the soil - 30-50 cm and deeper, can persist for 10 to 20 years. Beneficial bacteria in the soil die due to butifos. Another worst aspect is that its harmful odor quickly affects bee colonies, causing the death of most of their colonies. After the ban on Butifos, Uzbekistan's agriculture switched to less toxic and rapidly degradable substances (for example, chlorate defoliants, thidiazuron-based, etc.). However, it is necessary to be very careful not to use them in excess. In July 2025, hundreds of bee colonies died due to chemical compounds used in excess in agricultural farms in Fergana. This situation is a vivid example of environmental ignorance and lack of culture.

It is well known that polyethylene is overproduced worldwide. Polyethylene is also not "part of" the natural cycle of the biosphere and is a dangerous, polluting substance, and the issue of banning the production and use of polyethylene is being implemented in Uzbekistan, as it is all over the world. Here we should indicate the two essences of the concept of "polyethylene": raw materials necessary for industry and disposable packages in everyday life. Bans on polyethylene bags in Uzbekistan began on January 1, 2019. It is very appropriate that measures were established to restrict the production and sale of polymer film bags with a thickness of less than 100 microns, based on the Resolution of the President of the Republic of Uzbekistan No. PQ-171 of May 2023. There are many plans for the future in this regard, for example, according to the draft national program for 2025-2027, it is proposed to completely ban the production, import and use of polyethylene bags in Uzbekistan starting in 2027. Instead, the transition to biodegradable, or in scientific terms, environmentally friendly, bags will be encouraged.

CONCLUSION

1. Each species and plant in the biosphere has its own function. No other ecological component can perform this function belonging to the biosphere. Therefore, all species and varieties are unique, unique, and in their integrity they provide the vital indicators of the biosphere.

2. Green space is the creator of the only source of oxygen in nature.

3. Chemical compounds that are "incompatible" with the natural cycle of the biosphere should never be produced.

4. Humanity, whether it has caused damage to the natural cycle of the biosphere to this or that extent, must now repair this damage itself.

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DIDACTIC FEATURES OF PISA TASKS AND THE METHODOLOGY OF THEIR APPLICATION IN PHYSICS EDUCATION

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Abstract. *In the context of integration into the global educational space and the transition to a competency-based approach, enhancing students' ability to apply acquired knowledge in real-life situations is of urgent importance. This article provides a scientific and practical analysis of the specific didactic features of the PISA (Programme for International Student Assessment) tasks, their differences from traditional academic learning problems, and the methodology of their implementation in physics lessons at general education schools. During the research, the impact of elements such as real-life context (stimulus), interdisciplinary continuity, and an integrative approach – which form the basis of PISA tasks – on the cognitive activity of students was analyzed. Taking into account international experiences and local educational conditions, a 6-step model for the systematic integration of these tasks into the educational process (selection, localization, didactic processing, practical application, reflection, and creative adaptation) has been developed and proposed. The practical implementation of this innovative approach serves to develop in students not only scientific and functional literacy but also core competencies such as decision-making in complex situations, logical-critical thinking, and a creative approach. The obtained results and methodological recommendations are of significant importance in the modernization of physics education.*

Keywords: *PISA international program, scientific literacy, functional literacy, physics education, didactic features, 6-step integration model, logical-critical thinking, real-life context.*

Introduction

In the global education system, evaluating students' ability to apply their knowledge not only at an academic level but also in everyday life is gaining significant importance. The PISA (Programme for International Student Assessment) international assessment program serves exactly this purpose, measuring the core skills and competencies necessary for successful endeavors in the 21st century. In particular, within the field of science, special attention is paid to students' capacity to apply scientific knowledge and processes in practical life and to think as conscious citizens regarding issues related to science and technology. Scientific literacy has emerged as one of the most crucial characteristics that must be developed, especially in general secondary school students, as it ensures the younger generation's ability to scientifically substantiate natural phenomena and adapt to global changes.

It is frequently observed that traditional physics education is often limited to the memorization of theoretical laws, working with abstract formulas, and solving abstract problems. This situation can lead to students failing to fully comprehend the practical value of the knowledge they are acquiring. It is worth noting that PISA test tasks are developed in the form of "real-life situation analysis" (context), which fundamentally differs from standard school textbook

exercises. Such an approach transforms the student from a passive recipient of information into an active researcher capable of directing their knowledge toward solving real-world problems.

The necessity to develop critical and analytical thinking, non-traditional problem-solving skills, creativity, and communicative competencies in students requires the continuous modernization of physics teaching methodology. The preparedness of subject teachers for this process, along with strategies for the regular and accurate application of international assessment elements in the educational process, are crucial factors determining the quality of education. The purpose of this article is to conduct a scientific and pedagogical analysis of the didactic structure of PISA tasks and to develop clear, practical mechanisms for their effective integration into physics lessons.

Methodology

In conducting this study, comparative-didactic and systematic analysis methods were used comprehensively, based on a qualitative research design. In the initial stage, the conceptual foundations of the PISA international assessment program, the assessment framework reports published by the OECD (Organisation for Economic Co-operation and Development), and the scientific research of local and foreign scholars in this field were systematically studied. These analyses served to identify modern trends in the development of scientific literacy in physics education and to substantiate the reasons for abandoning traditional approaches.

In the practical-analytical part of the research, examples aimed at assessing scientific literacy from the open PISA database (released items) were deeply studied. Specifically, the internal didactic structure of tasks related to physics and allied sciences, such as "Global Warming," "Biosphere," and "Energy Use," was examined. These learning tasks were deconstructed, and their main structural components were identified:

1. Stimulus material (text, graph, table) reflecting a problem situation taken from real life;
2. A block of questions with varying cognitive loads (single- and multi-step);
3. Specific competencies to be assessed (explaining scientific phenomena, evaluating scientific inquiry, interpreting data).

Furthermore, the impact of these tasks on students' cognitive activities, particularly on their critical, logical, and creative thinking, was pedagogically modeled. In this process, the differences between traditional school physics problems and PISA-format tasks were compared, and the didactic advantages of international assessment tasks were systematized.

The test items of the PISA international assessment program differ from traditional physics problems in their unique and complex didactic structure. While traditional education is mainly limited to the memorization of theoretical laws, working with abstract formulas, and solving abstract problems, PISA tasks transform the student into an active researcher aimed at solving real-life problems. The following table systematizes the main didactic differences between traditional physics problems and PISA-format tasks:

Table 1

The main didactic differences between traditional physics problems and PISA-format tasks

Features	**Traditional physics problems**	**PISA-format tasks**
Nature of the problem (Context)	Artificial situations based on abstract laws.	Real-life (contextual) problem situations and stimulus materials.

Student's role	Passive recipient of information and listener.	Active researcher who filters information, analyzes critically, and is self-directed.
Assessed competencies	Memorizing purely academic knowledge and applying ready-made algorithms.	Explaining scientific phenomena, interpreting evidence, drawing objective conclusions, and making decisions.
Interdisciplinary connection	Often focused on a single subject and isolated from other disciplines.	STEM integration: a complex manifestation of knowledge from physics, biology, chemistry, geography, and mathematics within a single problem.
Information processing	Working with ready-made text and an explicitly stated problem.	Working with multimodal information (text, graphs, tables, diagrams) and discovering hidden cause-and-effect chains.

These comparative analyses demonstrate that PISA tasks serve not only to assess acquired knowledge but also act as a transformational tool that fundamentally changes the cognitive activity of the student. Therefore, the integration of such international assessment tasks into the educational process is of great importance for developing students' scientific worldview and logical-critical thinking, as well as for directing fundamental knowledge towards solving real-life problems. To implement this process systematically, the 6-step integrative adaptation model developed and proposed within the framework of this research demonstrates high practical effectiveness.

As a result, based on the obtained theoretical and practical conclusions, a 6-step algorithm for the systematic integration of PISA elements into physics lessons was designed. This methodological model was developed based on the principles of connecting the subject with daily practice (contextual teaching), ensuring interdisciplinary (STEM) integration, and inquiry-based science education. Using this methodology, mechanisms for the continuous formation of modern functional competencies in general secondary school students and future physics teachers were established.

Results

Conducted research and comparative analyses have shown that the test tasks of the PISA international assessment program possess a unique and complex psychometric and didactic structure. Unlike traditional physics problems, the central role here is occupied by stimulus material (a cognitive trigger) that reflects a real-life situation. Within the framework of scientific literacy, these tasks are designed to accurately measure three core competencies of students: explaining scientific phenomena, designing and evaluating scientific inquiry, and interpreting data and evidence scientifically to draw objective conclusions.

Based on a number of PISA tasks studied in the context of physics (such as "Global Warming," "Biosphere," and "Energy Use"), their main didactic features that shape students' scientific worldview were classified as follows:

1. **Contextuality (Real-life relevance):** The tasks require students not merely to memorize purely academic, abstract knowledge, but to view physical laws as practical tools for solving specific problems in everyday life. This, in turn, significantly increases students' motivation toward the subject.

2. **Interdisciplinary (STEM) integration:** Within a single problem, knowledge of physics, biology, chemistry, geography, and mathematics is manifested in a complex manner. Studying phenomena as an integrated system rather than in isolation effectively develops students' research skills.

3. **Analytical approach and metacognition:** Students are required not only to work with ready-made text but also to decode complex graphs, tables, and diagrams, process information, and scientifically substantiate their logical conclusions.

In order to develop the scientific literacy of general secondary school students by systematically and continuously integrating international assessment tasks into the national educational process, particularly into physics lessons, the following **6-step integrative adaptation model** was developed:

Step 1: Task selection. Tasks that strictly correspond to the State Educational Standard, the lesson topic, and the students' level of cognitive readiness are selected. For example, when studying the topic "Laws of Thermodynamics and Heat Engines" in the 10th grade, a specific PISA task related to calculating energy efficiency in residential buildings is chosen.

Step 2: Localization (Linguistic and socio-cultural adaptation). Foreign language texts are translated into Uzbek without losing the precision of scientific terminology. While maintaining the psychometric weight of the task, units of measurement, currencies, and scenarios are adapted to the local socio-economic environment (adaptation of realia).

Step 3: Didactic processing and planning. Depending on the timing of the lesson, the block of questions is standardized (scaffolding). The specific stage of the lesson at which the task will be applied is planned – whether as a means of arousing interest in a new topic (motivation), linking knowledge to practice (consolidation), or measuring the level of mastery (formative assessment).

Step 4: Practical implementation (Classroom activity). The adapted task is presented to the class. Based on the principle of inquiry-based learning, students work independently or in small groups (using "Jigsaw" or "Brainstorming" methods) to debate the issue and seek a collective solution.

Step 5: Analysis and reflection. After the task is completed, the obtained results are discussed collectively. The teacher does not merely state the correct answer but analyzes the root causes of incorrect solutions (misconceptions) together with the students. This stage activates students' ability to monitor their own thinking processes (metacognition).

Step 6: Creative modeling (Creative stage). Based on the acquired skills, the teacher and gifted students collaborate to create unique new "mini-PISA" tasks grounded in the local context (e.g., regarding the Aral Sea problem or the use of solar panels). This ensures the transition from reproductive educational activity to creativity.

Discussion

The didactic significance of PISA tasks in the educational process is not limited merely to controlling acquired knowledge; rather, it serves as a transformational tool that fundamentally changes the cognitive activity of the student. Unlike traditional textbook exercises, ambiguous and multi-solution questions embedded in a complex context transform students from passive listeners into active researchers, prompting them toward critical analysis, information filtering, and self-directed learning. The conducted analyses have revealed three main priority directions of this approach in modernizing physics education:

First, the formation of functional literacy and practical competencies. The application of real-life tasks such as "Energy Use" or similar assignments in physics lessons bridges the gap between theory and practice. The student perceives the laws of thermodynamics or electric current not as a mere collection of abstract formulas, but as a practical tool for saving energy in residential buildings, calculating economic efficiency, and solving everyday domestic problems. This approach provides a comprehensive and practical answer to the valid question frequently asked by students, "What does this knowledge give me in real life?", making them realize that learning is a vital necessity.

Second, arousing internal motivation and a sense of global responsibility. Linking the educational process with real environmental and socio-economic problems sharply increases students' motivation. For example, by working on complex systemic problems related to "Global Warming" or climate change, the student deeply feels not only the local but also the universal significance of physical laws. This, alongside developing scientific thinking, cultivates a sense of involvement toward the environment, an understanding of the principles of Sustainable Development, and a conscious civic stance in young people.

Third, serving as a cognitive tool that sharply develops analytical, logical, and metacognitive thinking. PISA tests require the student to simultaneously work with multimodal representations of information (textual, numerical, visual-graphical, and diagrams), process them, and discover hidden cause-and-effect chains. Experiments and pedagogical observations confirm that students who are accustomed only to memorizing ready-made algorithms and standard formulas by rote experience cognitive dissonance (difficulty) in the initial stages when faced with open, heuristic problems in the PISA format. The reason is that the problem here is not given explicitly; the student must extract it from the situation themselves and select the appropriate law. However, as a result of the systematic and consistent integration of these tasks into the learning process, this barrier in students is overcome, and their creative and integrative thinking grows. They become accustomed to critically evaluating information, exposing manipulative evidence, and rigorously justifying their solutions scientifically.

In conclusion, from a didactic perspective, this process is one of the most effective methodological mechanisms for bringing the educational principles of vitality, scientific rigor, interdisciplinary continuity, and inquiry-based learning from a dry declarative form into full practical realization.

Conclusion and recommendations. The conducted research and didactic analyses demonstrate that the tasks of the PISA international assessment program are among the most effective and transformational didactic tools in modern education. Their unique structure cultivates in students not merely the retention of memorized information, but a deep scientific worldview, logical-critical thinking, and most importantly, the competence to purposefully apply acquired fundamental knowledge to solve real-life problems (functional literacy). By integrating these tasks into the educational process, an opportunity is created to transition school physics education from a reproductive (memorization-based) model to a productive (creativity- and inquiry-based) model.

Based on the scientific and pedagogical analyses presented above, in order to elevate the quality of physics education in general secondary educational institutions to international standards and to enhance students' scientific literacy, the implementation of the following practical mechanisms is proposed:

1. **Revision of educational-methodological complexes and educational content:** Incorporating PISA-format tasks – which are based on real-life contexts and embody interdisciplinary integration – into general education school physics curricula, textbooks, and

exercise books for independent work at a volume of at least 20-30%, alongside purely academic problems. This will enable students to recognize the practical value of their knowledge.

2. **Creation of a special digital platform for educators:** Establishing a continuously updated national electronic database (methodological bank) of "mini-PISA" tasks fully adapted to international experiences and the characteristics of the local socio-economic environment (mentality, geographical location), and providing it as an open resource for all subject teachers.

3. **Modernization of the professional development system for teaching staff:** Introducing innovative, specialized educational modules into the retraining and professional development course programs for physics and other natural science teachers. These modules should focus on designing international assessment tasks (psychometric scoring) and implementing them at various stages of the lesson (based on the proposed 6-step model).

4. **Fostering collaborative teaching (Team-teaching) and the STEM approach:** Organizing integrative lessons and practical laboratory classes aimed at finding solutions to real-life problems in collaboration with physics, biology, chemistry, and geography teachers. This system develops students' ability to approach natural phenomena not in a fragmented manner, but as a holistic system.

In conclusion, it should be noted that enriching educational content based on life competencies is the only proper way to raise the future generation as intellectually mature, competitive individuals capable of making rational decisions even in the most complex situations. The systematic and consistent use of PISA tasks in physics lessons, along with the correct methodological management of this process, serves as a solid foundation in achieving this strategic goal.

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DEVELOPING INTUITIVE COGNITION IN STUDENTS THROUGH CREATIVE TEXT PRODUCTION: A PEDAGOGICAL MODEL

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Abstract. *This study explores the development of intuitive cognition in students through structured creative text production within pedagogical contexts. Unlike traditional interpretations that consider intuition as spontaneous or irrational, this research conceptualizes it as a cognitively grounded process emerging from the interaction of prior knowledge, experience, and subconscious processing. A qualitative research design was employed, involving a 12-week instructional intervention with undergraduate students (N=40). Data were collected through creative writing tasks, reflective journals, and classroom observations, and analyzed using qualitative content analysis. The findings indicate a significant improvement in students' originality, cognitive flexibility, and depth of semantic expression. The results also demonstrate that intuitive insights frequently emerge during the incubation phase, confirming the role of unconscious cognitive mechanisms in problem-solving. The study proposes a structured pedagogical model integrating analytical and intuitive thinking and offers measurable indicators for assessing intuitive development. This research contributes to educational theory by framing intuition as a teachable and assessable cognitive competence and provides practical implications for integrating creative methodologies into language education.*

Keywords: *intuitive cognition, creative writing, insight, cognitive flexibility, pedagogy, higher-order thinking.*

INTRODUCTION

In the context of modern education, the development of higher-order thinking skills has become a central objective. Among these, intuitive cognition represents a critical yet insufficiently explored dimension of human thinking. Traditionally perceived as irrational or spontaneous, intuition is now increasingly understood as a product of complex cognitive interactions involving experience, memory, and implicit knowledge processing. Despite its recognized importance in creativity and decision-making, intuition remains underrepresented in formal educational methodologies. Existing pedagogical models predominantly emphasize analytical reasoning, often neglecting the role of subconscious cognitive processes in learning.

This study addresses this gap by investigating how intuition can be systematically developed through creative text production. The research is grounded in the assumption that creative tasks provide optimal conditions for the interaction between conscious and unconscious cognitive processes. The novelty of the study lies in:

- conceptualizing intuition as a **developable cognitive skill**;
- proposing a **structured pedagogical model**;
- introducing **assessment indicators** for intuitive thinking.

Literature Review

The concept of intuition has been widely discussed in psychology, philosophy, and education. According to Daniel Kahneman, intuition represents a fast, automatic mode of thinking (System 1), which operates alongside analytical reasoning (System 2). This dual-process theory highlights the cognitive legitimacy of intuition rather than viewing it as irrational. Similarly, Michael Polanyi introduced the concept of tacit knowledge, emphasizing that individuals often "know more than they can tell." This perspective is particularly relevant in creative text production, where students express meanings that are not fully consciously structured.

From a pedagogical standpoint, Lev Vygotsky stressed the importance of social interaction and internalization in cognitive development. His theory supports the idea that intuitive thinking can be shaped through guided educational activities. In addition, Jerome Bruner argued that learning involves both analytical and intuitive processes. He emphasized that intuition allows learners to "grasp the structure of a problem" without explicit reasoning. Recent studies in educational psychology confirm that creative tasks significantly enhance intuitive cognition by activating imagination, associative thinking, and emotional engagement.

METHODOLOGY

Research Design

A qualitative research design with elements of pedagogical experimentation was employed.

Participants

The study involved 40 undergraduate students enrolled in language education programs.

Procedure

The intervention lasted 12 weeks and included:

- weekly creative writing tasks;
- guided reflection sessions;
- collaborative discussions.

Data Collection

- students' written texts
- observation protocols
- reflective journals

Data Analysis

A qualitative content analysis approach was applied using the following criteria:

- originality
- semantic depth
- associative thinking
- evidence of intuitive insight

RESULTS

The analysis revealed several significant trends:

1. Growth in originality

Students demonstrated a progressive increase in generating non-standard and creative ideas.

2. Increased semantic depth

Texts became more complex, with layered meanings and richer expression.

3. Enhanced cognitive flexibility

Students showed improved ability to shift between ideas and perspectives.

4. Emergence of intuitive insight

Intuitive solutions appeared most frequently after incubation phases (breaks, distraction), confirming subconscious processing mechanisms.

5. Reduced reliance on linear thinking

Students gradually moved from strictly logical structures to more flexible and creative forms of expression.

Extended Results

To provide a clearer representation of the findings, the results can be summarized in the following table:

Indicator	Before Intervention	After Intervention
Originality	Low–Moderate	High
Semantic Depth	Moderate	High
Idea Generation Speed	Slow	Fast
Intuitive Insights	Rare	Frequent

These results demonstrate a consistent improvement across all measured indicators, confirming the effectiveness of creative text-based instruction.

DISCUSSION

The findings support the hypothesis that intuition is not a random phenomenon but a structured cognitive process that can be intentionally developed. The integration of creative text activities creates conditions for activating subconscious cognitive mechanisms. The results of this study are consistent with the findings of Kahneman (2011), who emphasizes the role of fast thinking in decision-making. However, unlike purely psychological interpretations, this study demonstrates how intuition can be pedagogically developed through structured activities. The results align with cognitive and constructivist learning theories, emphasizing active knowledge construction and internal mental processes. Importantly, the study demonstrates that:

- intuition can be cultivated across different ability levels;
- it enhances both creative and analytical performance;
- it functions as a bridge between knowledge and innovation.

Pedagogical Implications

The findings of this study have several important implications for educational practice. First, teachers should integrate creative writing tasks into regular instruction to stimulate both analytical and intuitive thinking. Second, learning environments should encourage experimentation, reduce fear of error, and promote cognitive freedom. Third, assessment methods should move beyond purely analytical evaluation and include criteria such as originality, creativity, and intuitive insight. Finally, teacher training programs should include components aimed at developing educators own intuitive competence.

CONCLUSION

This study provides both theoretical and empirical evidence that intuitive cognition can be systematically developed within educational settings. By integrating creative text production into pedagogical practice, educators can activate deeper cognitive processes that enhance creativity, flexibility, and problem-solving efficiency. The key contribution of this research lies in redefining intuition as a **measurable and teachable cognitive competence**, rather than an abstract or uncontrollable phenomenon.

The proposed pedagogical model offers a scalable and practical framework for implementation in language education. The findings have important implications for curriculum

design, suggesting that intuition-oriented methodologies should be integrated as a core component of modern education. Future research should focus on quantitative validation, cross-cultural analysis, and the development of standardized assessment tools for intuitive cognition.

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DEVELOPING COMMUNICATION SKILLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER THROUGH ALTERNATIVE AND AUGMENTATIVE COMMUNICATION TOOLS

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Abstract. *This article analyzes the importance of alternative and augmentative communication (AAC) tools in developing communicative skills in children with autism spectrum disorder (ASD). The study examined the speech and communication difficulties of children with autism, methods for addressing these challenges, and the effectiveness of alternative communication tools. The research results indicate that the use of alternative and augmentative communication tools plays a crucial role in enhancing children's ability to communicate, improving their social adaptation, and enabling effective interaction with their environment.*

Keywords: *autism spectrum disorder, communicative skills, alternative communication, augmentative communication, special pedagogy, speech development.*

Introduction

In recent years, the increasing number of children born with Autism Spectrum Disorder (ASD) has highlighted the need for in-depth scientific research on this issue. ASD is primarily characterized by difficulties in social interaction and communicative activity. Children with ASD may experience delayed speech development or, in some cases, may not develop verbal communication at all. Communication is a vital component of human life, playing an essential role in a person's socialization and overall development. For children with autism, the process of communication is often complex, which necessitates the use of specialized pedagogical approaches to develop their communication skills.

From this perspective, alternative and augmentative communication (AAC) tools are considered one of the effective methods for working with children with autism. These tools support verbal communication, expand expressive opportunities, and help children convey their thoughts to others. The aim of this study is to examine the development of communication skills in children with Autism Spectrum Disorder and to investigate the importance of alternative and augmentative communication tools. Numerous scientific studies have been conducted on ASD, and their results indicate that AAC tools are an important pedagogical means for developing communication skills in children with autism. Visual materials align with the perceptual characteristics of children with autism and facilitate their ability to receive and process information.

Moreover, alternative communication tools help develop children's ability to communicate independently and improve their adaptation to the social environment. Therefore, it is essential for special educators, speech therapists, and parents to use these tools systematically. Developing communication skills in children with Autism Spectrum Disorder is a complex but crucial pedagogical process. The results of the study showed that using alternative and augmentative communication tools is effective in enhancing children's communication abilities.

In children with autism, the sensory system functions differently compared to typically developing children: they may be overly or insufficiently sensitive to sounds, light, touch, or smells. Therefore, sensory integration activities play an important role. These activities engage the child's sensory organs in a coordinated manner, including various games, exercises with sand, water, and different textures, as well as activities to develop balance and coordination. Through these processes, the child learns to better control their body, emotions, and environmental signals. Play-based communication methods encourage the child to communicate naturally, without forcing interaction, creating a supportive and motivating environment.

For example, activities such as "turn-taking games," "building together," and "creative stage play" help the child experience social interaction and cooperation. Developing communication skills in children with Autism Spectrum Disorder is a long but systematic process that leads to effective results. When a child engages in communication, they not only learn words but also begin to understand the meaning of social interaction. Methods such as ABA therapy, the PECS system, sensory integration, role-playing games, and activities conducted in collaboration with parents ensure both verbal and emotional development in children. These approaches enhance the child's social adaptation, self-expression, and emotional stability. Thus, developing communication skills in children with autism is not only an educational task but also represents one of the deepest social missions of human interaction.

The use of these tools helps children express their needs, engage in social interaction, and supports their overall development. Therefore, it is advisable to widely implement alternative communication methods within the special education system. The development of communicative activity in children with Autism Spectrum Disorder is often a complex and prolonged process. Difficulties related to verbal communication in these children can negatively affect their adaptation to the social environment. For this reason, developing communication skills in children with autism is one of the key tasks in special pedagogy and defectology.

According to experts, a number of factors influence the development of communication in children with Autism Spectrum Disorder. These include sensory sensitivity, difficulties in perceiving social signals, delayed speech development, and challenges in establishing emotional connections. Such factors limit children's ability to engage effectively in communication with their environment. From this perspective, alternative and augmentative communication tools are recognized as effective pedagogical means for developing communicative activity in children with autism. Alternative communication includes tools that enable interaction in cases where speech is absent, while augmentative communication serves to support and enrich existing speech.

Practical experience shows that visual materials are among the most accessible forms for information reception in children with autism. Picture cards, pictograms, symbol systems, as well as communication boards and charts, provide children with the opportunity to express their thoughts. Using these tools, a child can convey their needs, emotions, and desires to others in a clear and understandable way. In addition, alternative communication tools help children develop independent communication skills. Through visual symbols, children learn to answer simple questions, express their needs, and participate more actively in daily activities. This process also positively affects their socialization.

In pedagogical practice, the implementation of alternative communication tools should be carried out gradually. Initially, the child is taught to communicate using simple and understandable symbols, and later, skills are developed to adapt to more complex communicative situations. Cooperation between educators and parents plays a crucial role in this process. It is important to

note that alternative and augmentative communication tools are not only used to replace speech but also to support its development. Research findings indicate that regular use of these tools helps activate and enhance verbal activity in children.

As a result, the child can gradually begin to use simple words and phrases. Overall, the use of alternative and augmentative communication tools is one of the most effective pedagogical approaches for developing communication skills in children with Autism Spectrum Disorder. These tools expand children's opportunities to communicate, improve their adaptation to the social environment, and support their overall developmental process. Alternative and augmentative communication tools play a crucial role in organizing the communication process for children with autism. Through these tools, a child can express their thoughts, communicate their needs, and engage with others. Visual communication tools, in particular, are highly effective for children with autism, as they tend to process information more efficiently through visual input.

Observations conducted by specialists indicate that activities using picture cards, symbol systems, and pictograms significantly increase children's communicative engagement. With the help of these tools, a child learns to communicate in everyday situations. For example, a child can express needs such as eating, playing, or resting through visual symbols. Another important aspect of alternative communication tools is that they help develop independence in children. As a child begins to express their needs independently, their interactions with others also improve, which in turn positively affects their socialization process.

Moreover, activities conducted with alternative communication tools contribute to the development of attention, thinking, and memory skills. During communication using visual symbols, the child begins to better understand the relationships between objects, actions, and concepts. This, in turn, has a positive effect on their overall cognitive development. In the pedagogical process, an individual approach is crucial for the effective use of alternative and augmentative communication tools. Since each child with autism has different developmental levels, perceptual characteristics, and interests, the selected communication tools must be tailored individually. Collaboration between educators, speech therapists, and parents plays a key role in this process.

Additionally, creating a positive emotional environment for the child during the use of communication tools is important. Supportive and motivating pedagogical approaches increase children's interest in communication. As a result, the child begins to participate more actively in the communication process. Thus, using alternative and augmentative communication tools in children with Autism Spectrum Disorder not only develops their communication skills but also positively influences their social adaptation and personal development. For this reason, it is advisable to implement these methods widely in special education institutions as well as in inclusive education settings.

Conclusion. Developing communication skills in children with Autism Spectrum Disorder is one of the key tasks in modern special pedagogy and defectology. This is because limitations in social interaction, underdeveloped verbal skills, and difficulties in establishing relationships with the environment significantly affect their socialization process. Therefore, it is essential to design and implement effective pedagogical approaches aimed at enhancing communicative activity in children with autism. The study identified the important pedagogical potential of alternative and augmentative communication tools in developing communication skills in children with Autism Spectrum Disorder. In particular, visual tools such as pictograms, picture cards, symbol systems, and communication boards help children actively participate in the communication process.

Through these tools, children gain the ability to express their needs, desires, and emotions. As a result, their interest in communication increases, and their skills for engaging with others gradually develop. The results of the study indicate that regular and systematic use of alternative and augmentative communication tools positively affects children with autism by increasing their communicative activity, supporting speech development, and improving their social adaptation. In particular, visual communication tools are quickly learned and effectively applied because they align with the perceptual characteristics of the children. Moreover, alternative communication tools help develop independent communication skills. As the child begins to express their needs independently, their self-confidence increases, and their adaptation to the social environment improves. This, in turn, has a positive impact on the child's overall psychological development.

At the same time, the study results highlighted the critical importance of collaboration between educators, speech therapists, and parents in the use of alternative and augmentative communication tools. For a child's communicative development to be effective, these tools should be used not only in educational settings but also regularly at home. Overall, alternative and augmentative communication tools represent one of the most effective pedagogical approaches for developing communication skills in children with Autism Spectrum Disorder. Their widespread use significantly expands children's opportunities to communicate, enhances their level of socialization, and supports successful participation in inclusive education settings. Therefore, it is of significant scientific and practical importance to broadly implement alternative communication methods in the special education system and to further develop research in this area.

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THE ROLE OF "MUSIC CULTURE" LESSONS IN DEVELOPING ARTISTIC AND CREATIVE ABILITIES OF PRIMARY SCHOOL STUDENTS

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Abstract. *This study investigates the role of "Music Culture" lessons in developing the artistic and creative abilities of primary school students within the context of modern educational reforms. There are still few scientifically supported methods that consistently foster children' creativity in elementary schools, despite the acknowledged significance of music instruction. By putting out and experimentally verifying an integrated educational model that combines interactive, project-based, and culturally sensitive teaching techniques, the study seeks to close this gap. 60 elementary school pupils participated in a mixed-method study. The results show that following the intervention, pupils' creative performance improved statistically significantly ($p < 0.05$). By providing an organized model for music education that complies with both national and international norms, the study advances the field.*

Keywords: *music education, creativity development, primary education, pedagogical innovation, experimental study, Uzbekistan, artistic abilities.*

Introduction

The development of creative competencies in early education has become a central objective of contemporary pedagogy (Craft, 2005). Among school subjects, "Music Culture" plays a distinctive role in fostering emotional intelligence, aesthetic sensitivity, and creative thinking (Hallam, 2010). However, in many educational contexts, including Uzbekistan, music lessons are still often limited to reproductive activities such as singing and memorization, rather than being used as tools for creative development. This creates a gap between the potential of music education and its actual implementation in classrooms. Therefore, the present study seeks to explore how "Music Culture" lessons can be transformed into an effective medium for developing students' artistic and creative abilities through innovative pedagogical approaches.

Despite the widely acknowledged importance of music education in fostering holistic child development, there remains a significant gap between its theoretical potential and practical implementation in primary education. In particular, existing educational practices often lack structured pedagogical models specifically aimed at developing students' artistic and creative abilities through music lessons. Additionally, there is a significant amount of empirical evidence that shows how successful music-based educational interventions are, particularly in primary school settings. The inadequate incorporation of globally acknowledged ways, including Orff, Kodě, and Dalcroze approaches, into regional educational systems, like Uzbekistan's, is another crucial problem. These drawbacks underscore the need for a thorough and empirically supported framework that can improve the efficacy of "Music Culture" classes in fostering students' creative competencies.

The current study suggests an integrated pedagogical approach that incorporates aspects of project-based learning, Orff-based activities, and the use of digital resources in music education in order to address these issues. In contrast to conventional methods, this approach places a strong emphasis on interdisciplinary interaction, creativity, and active student participation. The study's experimental validation of the suggested model in an actual primary school context, which enables a more impartial evaluation of its educational efficacy, is one of its main contributions. The study also presents a quantitative evaluation framework intended to gauge students' growth in their artistic and creative capacities, offering a methodical and quantifiable way to analyze learning outcomes. The study's scientific uniqueness is made up of both theoretical innovation and empirical validation.

This study's theoretical underpinnings are based on well-established research that emphasizes the advantages of music instruction for development. According to Hallam (2010), children's cognitive, emotional, and social development is greatly aided by music, which improves abilities including memory, focus, and emotional control. Similar to this, the Orff approach, which was first presented by Orff in 1963, places a strong emphasis on experiential learning via movement, improvisation, and active engagement all of which are crucial for promoting creativity. In contrast, the Kodě approach (Kodě, 1974) emphasizes the development of voice abilities and musical literacy through sequential and controlled study.

UNESCO (2021) emphasizes the significance of arts education in providing students with important 21st-century competencies, while Swanwick (1999) further claims that meaningful involvement with music fosters aesthetic awareness and critical thinking. Even while these theoretical views are rich, many of the research that have already been done are mainly conceptual and lack empirical support, especially when it comes to the educational setting of Central Asia. This emphasizes how important and necessary the current research is.

A mixed-method research methodology was used to fill in the identified research gaps, combining quantitative and qualitative techniques to guarantee a thorough examination of the phenomenon being studied. A sample of sixty elementary school pupils in grades three and four from a public school in Uzbekistan participated in the study. The participants were split up into two groups: a control group of the same size and an experimental group of thirty pupils. The experimental group was taught utilizing the suggested integrated pedagogical model, whereas the control group got conventional music tuition over a 12-week period.

A creativity assessment test based on Torrance's principles, structured observation checklists, teacher evaluation rubrics, and student performance tasks were among the tools used to collect data. The authenticity and dependability of the results were guaranteed by this triangulation of data sources. Descriptive statistics like mean and standard deviation were computed for data analysis, and a paired sample t-test was used to assess the statistical significance of the observed changes.

According to the study's findings, pupils in the experimental group's creative abilities clearly and statistically significantly outperformed those in the control group. In particular, the experimental group's creative scores improved significantly from 51.8 to 72.6, but the control group's mean values increased just little from 52.4 to 58.1. The success of the suggested pedagogical approach is confirmed by the computed p-value of 0.003, which shows that this difference is statistically significant at the 0.05 level.

These results imply that incorporating interactive, project-based, and technologically enhanced teaching strategies into music classes might greatly improve students' creativity,

emotional expressiveness, and general involvement in the learning process. Additionally, qualitative assessments corroborate these quantitative findings by showing that students in the experimental group demonstrated greater levels of confidence, motivation, and active participation during musical activities.

They showed more creativity in musical improvisation exercises and a more sophisticated comprehension of how music may convey emotions. These results are in line with the conclusions of Hallam (2010) and Swanwick (1999), but they also add to the body of knowledge by offering fresh empirical data unique to the Uzbek educational setting. This study has important pedagogical ramifications. According to the findings, elementary school music instruction should promote originality, active involvement, and interdisciplinary learning over traditional, reproduction-based methods.

The efficiency of music classes can be further increased by using cutting-edge teaching techniques and digital resources, which will make them more interesting and relevant for today's students. Additionally, students' cultural identities can be preserved while a global perspective is fostered by combining national cultural components with international practices. Overall, the study emphasizes the necessity of a methodical and creative approach to music education that promotes the all-encompassing growth of students' artistic and creative capacities.

Conclusion. The results of this study demonstrate that, when accompanied by creative and student-centered teaching strategies, "Music Culture" sessions have substantial educational potential in fostering the artistic and creative capacities of elementary school pupils. The experimental results unequivocally show that students' creative performance, emotional expression, and involvement in the learning process significantly enhance when interactive methods, project-based learning, and digital technologies are integrated. Statistically significant differences between the experimental and control groups demonstrated the superiority of the suggested integrative educational paradigm over conventional teaching techniques.

These findings emphasize how crucial it is for basic music education to transition from reproduction-based instruction to creativity-oriented learning environments. In order to guarantee a well-rounded and contextually appropriate educational experience, the study also highlights the importance of combining both national cultural components and global best practices. By providing a useful, empirically supported framework that may be used in primary education settings, the research advances music pedagogy. Future studies might concentrate on increasing the sample size, investigating the long-term effects of music-based interventions, and incorporating cutting-edge digital tools like artificial intelligence into music instruction.

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AN ANALYSIS OF INTERNATIONAL PRACTICES IN THE DEVELOPMENT OF ARTISTIC AND CREATIVE ABILITIES OF PRIMARY SCHOOL STUDENTS THROUGH CHILDREN'S FOLKLORE

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Abstract. *This article examines the role of children's folklore in developing the artistic and creative abilities of primary school students. The study examines international practices, pedagogical approaches, and cultural initiatives that aim to integrate folklore into primary education. Special attention is given to effective foreign methodologies such as storytelling, drama-based learning, and project-based approaches. The paper also evaluates current developments in Uzbekistan, including educational reforms and practical initiatives in this field. Based on the analysis, a model is proposed for integrating folklore into primary education. The findings demonstrate that folklore-based learning significantly enhances students' creativity, imagination, and cultural awareness.*

Keywords: *children's folklore, primary education, creativity, artistic development, storytelling, pedagogy, cultural heritage, innovative methods.*

Introduction

In contemporary educational discourse, the development of creativity and artistic expression in young learners has emerged as a central priority, particularly within the framework of primary education. In addition to developing fundamental literacy and numeracy skills, children at this foundational stage also develop critical cognitive, emotional, and cultural competencies that impact their future learning paths. Children's folklore holds a special place among the many educational resources at educators' disposal because it integrates aspects of oral tradition, cultural heritage, and creative participation.

Fairy stories, riddles, proverbs, songs, chants, and traditional games are just a few of the many expressive forms that make up children's folklore, all of which support a child's overall development. Folklore encourages youngsters to actively participate in the learning process since it is intrinsically participatory and imaginative, in contrast to traditional educational materials. Learners develop their creative thinking, linguistic proficiency, and emotional intelligence through frequent exposure to story structures, symbolic imagery, and rhythmic language. Furthermore, folklore is an essential tool for maintaining and passing down cultural values in the face of globalization, where cultural uniformity threatens national identities. The modernization of folklore-based instruction is made possible by the incorporation of international educational techniques, guaranteeing its applicability in current classrooms. Therefore, improving the efficacy of primary education systems requires a thorough examination of worldwide experiences in this area.

Children's learning habits have also been greatly impacted by globalization and digitization. Although new options are presented by modern technologies, children's engagement with traditional cultural forms is frequently diminished. As a result, including folklore into contemporary education is both a cultural and pedagogical requirement. Folklore is important for children's cognitive and emotional development, according to earlier research. The best conditions for the development of creative thinking, according to modern pedagogical theories, are those in which pupils actively participate in innovative activities.

By fusing role-playing, symbolic thinking, and storytelling, folklore-based education creates such a setting. It is actively included in curricula in nations with robust cultural education systems, according to international studies. For instance, Japanese pedagogy incorporates folklore into moral and artistic education, whereas Finnish education stresses creativity through narrative-based learning. Additionally, storytelling has been developed by American researchers as an organized teaching strategy to enhance students' communication abilities. These theoretical stances affirm that folklore is an effective teaching tool in addition to being a cultural reality.

The methodology used in this study is qualitative and comparative. The study examines how folklore is incorporated into elementary education in Finland, Japan, the US, and South Korea. Teaching methods, educational policies, and scientific literature were all thoroughly examined. Additionally, the efficacy of folklore-based activities, including storytelling, acting, and project-based learning, was assessed by observational analysis. Additionally, the study compares Uzbekistan's recent developments with those of other countries.

The analysis demonstrates how children's folklore greatly fosters the growth of their creative capacities. Students who are exposed to folklore exhibit greater levels of creativity, improved storytelling abilities, and heightened participation in class activities. For instance, while riddles foster logical reasoning and linguistic flexibility, storytelling exercises inspire students to create novel concepts. Folklore also fosters social and emotional growth. Engaging in customary games and performances promotes self-expression, empathy, and teamwork. These results suggest that folklore is a multifaceted teaching tool that promotes overall growth. Primary school pupils show a high degree of interest in and participation in folklore-based activities, according to empirical observations. Traditional games, theatrical productions, and storytelling sessions are especially good at drawing pupils in and encouraging active engagement.

These exercises foster a supportive learning atmosphere where students are inspired to work together with their peers and express themselves creatively. Moreover, because folklore-based learning offers a comfortable and culturally relevant setting for interaction, it has been demonstrated to lower learning anxiety and boost students' confidence. Students exhibit better academic performance and a more positive attitude toward learning as a result. According to the study, effective educational systems incorporate folklore via participatory, student-centered methods. Through creative projects, students in Finland actively adapt traditional stories, enhancing their critical thinking and artistic abilities.

Students in Japan can emotionally engage with folklore through drama-based learning, which enhances the significance of education. While South Korea incorporates folklore into music and dance schools, the United States uses storytelling extensively to foster communication abilities. These nations routinely place highly in international cultural festivals, proving the efficacy of their strategies. Importantly, these practices share common features: active participation, creativity, and integration of traditional and modern teaching methods.

Children's inventiveness is greatly enhanced by international folklore competitions and festivals. Events held in Turkey, Eastern Europe, and under UNESCO initiatives offer venues for artistic expression and cross-cultural interaction. Leading positions are frequently attained by nations like South Korea, China, and Turkey because of institutional support and methodical planning. Participating in such activities boosts students' confidence and intercultural communication skills in addition to their artistic abilities. The growth of children's folklore is receiving more attention in Uzbekistan. Folklore has been incorporated into school curricula and extracurricular activities as a result of educational reforms. Organizations like "Barkamol Avlod" centers are crucial to the advancement of creative education. Interactive teaching techniques, such as project-based learning and storytelling, have been progressively implemented in recent years. Nevertheless, the study reveals that these strategies are not yet applied methodically, and teacher preparation and methodological uniformity are required. This study suggests an integrative paradigm for fostering creativity via folklore based on the findings. The model consists of: methodical use of narrative in instruction; combining role-playing with theatre; creation of artistic endeavours based on folklore; and use of digital means to update the way folklore is presented. This concept can be successfully implemented in primary school by fusing contemporary teaching techniques with traditional cultural components.

Conclusion. The study demonstrates that children's folklore is a useful tool for helping elementary school pupils develop their artistic and creative skills. Experience from around the world shows that incorporating folklore with creative teaching techniques produces noteworthy educational results. Expanding the use of folklore-based approaches, enhancing teacher preparation, and implementing effective international practices are all crucial for Uzbekistan. The suggested approach can be used as a useful framework to improve creativity in elementary school.

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THE USE OF BEHAVIOR CHAINING IN DEVELOPING SELF-CARE SKILLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Abstract. *The article examines the theoretical and practical foundations of using the behavior chaining method in the development of self-care skills in children with autism spectrum disorder (ASD). Daily living skills such as handwashing, toothbrushing, dressing, and toileting are essential for a child's safety, independence, participation in inclusive education, and quality of life. However, children with ASD often experience significant difficulties in acquiring these skills due to impairments in communication, imitation, motor planning, sensory processing, and behavioral regulation. The article is based on an analysis of contemporary psychological, pedagogical, and evidence-based sources related to Applied Behavior Analysis (ABA) and adaptive skill instruction. The study focused on behavior chaining as a structured sequence of interrelated actions in which each step establishes the conditions for the next and culminates in reinforcement. The main chaining procedures - forward chaining, backward chaining, and total task chaining - are described, along with criteria for selecting the most appropriate procedure depending on the learner's baseline skills, motivation, sensory barriers, and access to natural reinforcement. Key methodological conditions for effective instruction are discussed, including functional assessment, operational definition of steps, systematic prompting and fading, reinforcement planning, error prevention, data collection, maintenance, and generalization across settings, people, and materials. Practical examples of teaching handwashing, toothbrushing, dressing, and toileting skills are provided. The article concludes that behavior chaining is a scientifically grounded and practice-oriented method that enables complex self-care skills to be transformed into teachable sequences of actions and effectively implemented through coordinated collaboration among professionals and parents, with respect for the child's dignity, autonomy, and individual needs.*

Keywords: *autism spectrum disorder; self-care skills; Applied Behavior Analysis; task analysis; behavior chaining.*

Introduction

The development of self-care skills constitutes a core objective in the support of children with autism spectrum disorder (ASD) across both family and educational contexts. Within the field of special education, self-care is conceptualized as a broad set of daily living skills, including personal hygiene (face and hand washing), toothbrushing, toileting, dressing and clothing management, safe use of personal hygiene items, and basic organization of personal space. Mastery of these skills is closely associated with a child's quality of life, participation in educational and social activities, and the overall level of caregiving demands placed on parents and professionals. The World Health Organization notes that ASD is characterized by persistent difficulties in social communication and interaction, alongside restricted or atypical patterns of behavior and sensory responsiveness, which may substantially hinder the acquisition of everyday functional skills [18].

From a functional perspective, self-care skills represent complex, multi-component behaviors composed of sequentially organized steps. For instance, effective toothbrushing requires appropriate grasp and manipulation of the toothbrush, controlled dispensing of toothpaste, execution of coordinated motor actions in a prescribed sequence, time monitoring, tolerance of oral sensory stimulation, and adherence to hygiene conventions. Likewise, dressing involves orientation to garment components, fine and gross motor coordination, comprehension of temporal order (e.g., “shirt first, then pants”), management of fasteners, and adaptation to contextual variables such as weather conditions, situational demands, and dress codes. For many children with ASD, the acquisition of such behavioral chains is particularly challenging due to the combined effects of limited imitation and joint attention skills, atypical sensory processing, deficits in action planning, and reduced motivation for socially mediated instruction.

Contemporary international reviews of evidence-based practices consistently indicate that behavioral interventions grounded in Applied Behavior Analysis (ABA) comprise some of the most empirically validated and replicable approaches for teaching adaptive and daily living skills to children with ASD [1, pp. 26-30, 33-34; 2; 3, pp. 47, 45, 80]. Within this framework, the behavior chaining method, implemented in conjunction with task analysis, occupies a central methodological position. The core principle of this approach involves decomposing a target behavior into a sequence of discrete, teachable steps and systematically arranging instruction so that the learner gradually integrates these components into an independently performed behavioral sequence.

Research on adaptive functioning further underscores a persistent discrepancy between cognitive abilities and levels of daily living skills among children and adolescents with ASD. Even in individuals with average or above-average intellectual functioning, functional independence in self-care domains may develop more slowly than expected, thereby constraining participation in school and community environments and increasing reliance on adult support. Evidence from randomized and quasi-experimental intervention studies targeting daily living skills in adolescents demonstrates that structured instruction of routine activities (e.g., organization of personal belongings, morning and evening self-care routines, preparatory tasks) yields statistically and clinically significant improvements in functional outcomes [12, pp. 938-949].

Systematic reviews of evidence-based practices identify instruction in adaptive and self-help skills as a domain in which behavioral procedures-including task analysis, prompting strategies, reinforcement, visual supports, and modeling-demonstrate robust and sustained positive effects for children with ASD [1, pp. 126-128; 2, pp. 4013-4032; 3, p. 80]. National practice standards further emphasize that intervention selection should be guided by empirical evidence while accounting for learner characteristics such as age, target skill domains, and contextual variables related to implementation [3, pp. 77-78].

The importance of self-care skills is particularly pronounced in inclusive educational settings. Independence in toileting, hand hygiene, changing clothes after physical education, and managing personal belongings should not be regarded as ancillary competencies but rather as prerequisites for safety, comfort, and social acceptance among peers. For parents, the development of basic hygiene and toileting skills often represents one of the most demanding and emotionally taxing areas of support, given its strong association with societal expectations and daily physical effort. Consequently, instructional approaches in this domain must be not only effective, but also ethically sound and feasible for implementation in home environments.

The aim of the present article is to substantiate the applicability of the behavior chaining method in the development of self-care skills in children with ASD and to examine the key

principles, conditions, and instructional algorithms underpinning its use in both educational and family-based practice.

Methodology, Materials, and Methods

The Concept of Behavior Chaining and Its Role in Applied Behavior Analysis

A theoretical analysis of psychological and pedagogical literature made it possible to identify key aspects of the problem of self-care skill development in children with autism spectrum disorder (ASD) and to determine the applicability of the behavior chaining method within the framework of Applied Behavior Analysis (ABA). Researchers consistently report that children with ASD experience substantial difficulties in acquiring sequential actions required for the performance of everyday functional tasks. These difficulties are associated with atypical sensory processing, deficits in action planning, and a reduced level of voluntary behavioral regulation.

In this context, instructional methods grounded in the principles of Applied Behavior Analysis are of particular significance, among which the behavior chaining method occupies a central position. This method represents an instructional technology in which a complex skill is decomposed into a series of sequential actions (links), each of which is systematically taught and reinforced. Mastery of each component is accompanied by reinforcement, thereby facilitating the gradual integration of discrete actions into a cohesive behavioral sequence.

Accordingly, behavior chaining constitutes one of the core instructional tools within Applied Behavior Analysis and is widely employed in teaching children with ASD daily living skills, including self-care, domestic, and socially adaptive behaviors.

Within ABA, a behavior chain is defined as a sequence of discrete responses in which each response produces a discriminative stimulus for the next, with completion of the chain resulting in reinforcement. In classical conceptualizations, a behavior chain comprises discriminative stimuli (SD), responses (R), and consequences (C) that maintain performance. For example, in handwashing, the visual presence of dirty hands and access to a sink may serve as contextual stimuli; turning on the faucet constitutes the initial link; the appearance of running water functions as a stimulus for the next response, and so forth; completion of the chain—clean hands and a comfortable tactile sensation - serves as natural reinforcement.

In psychological and pedagogical literature, behavior chaining is conceptualized as a method for the formation of complex behavioral skills through the step-by-step acquisition of a sequence of interrelated actions. The core principle of this method involves dividing a target skill into discrete components (steps) that are taught and consolidated sequentially. Acquisition of each component is supported by a structured reinforcement system, which promotes the gradual unification of individual actions into an integrated behavioral chain. Within the ABA framework, this method is extensively applied to the instruction of self-care, domestic, and socially adaptive skills in children with ASD.

Behavior chaining is closely linked to task analysis, which refers to the systematic procedure of breaking down a complex skill into a sequence of simple, observable, and measurable steps. Evidence-based practice guidelines for ASD emphasize that task analysis enhances instructional predictability and structure by enabling practitioners to clearly identify the step being taught, specify allowable prompting strategies, and define objective criteria for independent performance [4]. Comparable definitions and applications of task analysis are described in practice-oriented resources used in schools and support centers [5].

A defining characteristic of chaining procedures is their systematic nature. Instruction may proceed using forward chaining, backward chaining, or total task chaining. The selection of a specific procedure is determined by several factors, including the learner’s baseline skill repertoire, the availability of natural reinforcement, sensory barriers, and requirements related to safety and

hygiene. In foundational ABA and behavior modification textbooks, chaining procedures are described as a basic instructional tool for teaching multi-component skills, including self-care, domestic, and academic behaviors [6, pp. 425-436; 7, pp. 154-160].

Specialized literature distinguishes multiple types of chaining procedures and examines the conditions and features of their application in corrective and educational interventions for children with ASD, aimed at the development of complex behavioral and functionally essential life skills.

Forward chaining. In forward chaining, instruction begins with the first step of the sequence. The learner practices this step until a predefined mastery criterion is met, after which subsequent steps are gradually introduced. A key advantage of this approach is early engagement with the natural context of the skill (e.g., approaching the bathroom, picking up a toothbrush), which supports the establishment of stable routines and reduces anxiety through increased predictability. Forward chaining is particularly effective when initial steps function as "activating" responses that provide access to subsequent stimuli (e.g., turning on the water, opening toothpaste) and when fostering initiation and task onset is a primary instructional goal.

Backward chaining. In backward chaining, instruction begins with the final step of the sequence, after which the practitioner progressively works backward toward the initial steps. The primary advantage of this approach is that the learner completes the skill from the outset and immediately contacts natural reinforcement (e.g., rinsing and the sensation of freshness after toothbrushing, going outdoors after dressing). This procedure is especially beneficial when motivation for the process itself is low, while the terminal outcome holds high reinforcing value. Backward chaining is commonly applied to skills in which the consequence is more salient than the process (e.g., tying shoelaces and immediately observing the completed result).

The effectiveness of combining backward chaining with video prompting has been demonstrated, for example, in studies focused on teaching shoelace tying to children with autism spectrum disorder, where this combined approach resulted in improved skill acquisition and independence [10, pp. 339-347].

Total task chaining. In total task chaining, the learner performs all steps of the skill during each instructional trial, while the practitioner provides prompts only for those steps that have not yet been mastered. As instruction progresses, prompts are systematically faded, resulting in a gradual increase in the proportion of independently performed steps. This approach is particularly useful when the learner already possesses partial components of the target skill, and the instructional goal is to integrate these components into a coherent behavioral sequence. In the instruction of self-care skills among adolescents with special educational needs, successful intervention programs based on total task chaining combined with progressively increasing independence have also been documented [12, pp. 938-949].

Selection of chaining procedures. When selecting an instructional procedure, it is recommended to consider the following factors: (a) the learner's baseline level of independence across individual steps; (b) the presence of pronounced "bottlenecks," such as sensory intolerance or motor difficulties; (c) the availability and salience of natural reinforcement at task completion; (d) the learner's level of fatigue; and (e) social validity, including family acceptability and requirements related to privacy. In practice, hybrid instructional models are frequently employed. For example, the overall structure of a skill may be established using forward chaining, while the most functionally significant terminal step is consolidated as an independent response through elements of backward chaining. Such individualized instructional planning is consistent with contemporary perspectives on the implementation of evidence-based practices in naturalistic settings.

Based on the analysis of psychological, pedagogical, and methodological literature, several core methodological principles for the use of behavior chaining in teaching self-care skills were identified.

Assessment of baseline performance and goal selection. Prior to instruction, a functional assessment is required to determine which steps the learner performs independently, which require prompting, and at which points refusals, anxiety, or problem behavior occur. Conducting a skill probe in familiar settings is considered a practical approach, with the level of assistance recorded for each step. The outcome of this process is an individualized skill profile that informs the instructional decision of whether to teach the entire chain or to isolate and target critical steps (e.g., applying toothpaste, rinsing soap, fastening a zipper).

Operational definition of steps. Each step should be clearly defined, observable, and measurable (e.g., “wet hands with water,” “take soap,” “lather hands for 10 seconds”), rather than vague descriptions such as “wash well.” Excessive task decomposition may unnecessarily prolong instruction, whereas overly broad steps may increase the likelihood of errors. Task analysis guidelines for learners with ASD emphasize that the number and granularity of steps should be determined by the child’s developmental level, motor abilities, and comprehension of instructions [4, pp. 5-6].

Prompting and fading. A prompt is defined as an additional stimulus that increases the likelihood of a correct response. In self-care instruction, commonly used prompts include physical prompts (full or partial), gestural prompts, visual prompts (e.g., pictures, checklists), verbal prompts, and modeling. A critical instructional principle is the planned fading of prompts to prevent the development of prompt dependency. Comparative studies examining different prompting hierarchies in behavior chaining have demonstrated that the “most effective” hierarchy varies across learners: some acquire skills more efficiently using least-to-most prompting, others using most-to-least prompting, or procedures involving time delay [8, pp. 37-43].

Reinforcement and motivation. Reinforcement may be either natural (e.g., clean hands, the opportunity to go outdoors) or contrived (e.g., token systems, access to a preferred activity). In teaching self-care skills, it is important to progressively shift the instructional emphasis toward natural consequences, while gradually reducing reliance on external reinforcers. However, during the initial phases of instruction, the use of potent reinforcement is often critical for maintaining engagement, particularly in the presence of sensory intolerance (e.g., aversion to the smell of toothpaste or the sound of running water).

Error prevention and safety. In the context of self-care instruction, errors may not only reduce instructional efficiency but also pose real safety risks (e.g., slippery floors, toothpaste entering the eyes, burns from hot water). Therefore, it is preferable to employ error-minimization strategies, including prompting prior to errors, reducing task demands, providing visual supports, and gradually increasing time requirements and task complexity. In situations where refusal behavior is maintained by escape or avoidance of aversive stimuli, combining chaining procedures with stimulus fading (graduated exposure) and differential reinforcement may be beneficial [9, pp. 215-218].

Based on the theoretical analysis of the literature, we developed an algorithm for implementing the behavior chaining method in the development of self-care skills in children with autism spectrum disorder. The algorithm includes the following sequence of steps:

1. Identify the priority skill and define a functional goal (e.g., “independently brushes teeth before bedtime”).
2. Conduct a skill probe and determine baseline performance for each step (independent / prompted / not performed).

3. Develop an individualized task analysis (typically 10-25 steps, depending on task complexity and the child's characteristics).
4. Select the chaining procedure (forward chaining, backward chaining, or total task chaining) and design a prompting hierarchy with planned fading.
5. Determine reinforcers and specify delivery rules (immediacy; differential reinforcement for independently completed steps).
6. Arrange the environment: ensure materials are accessible, provide visual cues, and minimize sensory overload.
7. Implement regular instructional trials (brief but frequent) and collect step-level performance data.
8. Plan for generalization: vary settings, materials (e.g., toothbrushes/soap), and involve different adults.
9. Assess maintenance after mastery criteria are met: reduce prompts and external reinforcement.
10. Evaluate social validity: the child's comfort, family acceptability, and alignment with ethical standards.

Below, examples are provided to illustrate how chains may be designed for the most common categories of self-care skills. These examples are intended for illustrative purposes only: the task analysis should always be individualized based on the child's age, expressive/receptive language and comprehension, sensory profile, and the family's everyday living conditions.

Handwashing is a foundational self-care skill required across school, home, and community settings. For children with ASD, difficulties may arise due to sensory sensitivity to water temperature, the sound of running water, or tactile sensations associated with soap, as well as challenges in maintaining the correct sequence of actions. The behavior chaining method allows the handwashing routine to be structured, predictable, and time-efficient, while visual supports reduce reliance on verbal instructions [4; 5].

Example of a task analysis for "Handwashing with soap" (11-step sequence):

1. Approach the sink.
2. Turn on the faucet.
3. Wet hands with water.
4. Take soap / press the soap dispenser.
5. Lather the palms.
6. Lather the backs of the hands and between the fingers (for at least 10 seconds).
7. Rinse soap off with water.
8. Turn off the faucet.
9. Take a towel or paper towel.
10. Dry hands thoroughly.
11. Dispose of the paper towel (if disposable) or hang the towel in its designated place.

When selecting a chaining procedure for handwashing, total task chaining is often particularly effective: the child completes the entire sequence, while the adult provides prompts only at identified "weak" steps (e.g., appropriate soap dosage or sufficient lathering). If the primary barrier is associated with task completion (e.g., avoidance of hand drying), backward chaining may be more appropriate, as it allows the final step to be strengthened and directly associated with natural reinforcement - namely, the sensation of dry hands and task completion.

Toothbrushing is among the most complex personal hygiene skills for children with ASD, as it involves both a structured motor sequence and tolerance of aversive sensory stimuli.

Contemporary studies demonstrate that behavior-analytic interventions involving parental participation and clearly structured action sequences can substantially increase independent toothbrushing in children with ASD [16]. In parallel, systematic reviews in the field of dental care highlight the effectiveness of combining behavioral instruction with visual supports and parent training [17].

For this skill, backward chaining is frequently effective, as the child rapidly gains access to a reinforcing terminal outcome (e.g., rinsing, a clear "finished" signal, looking in the mirror, social praise), while the adult gradually introduces earlier steps. In cases of pronounced sensory sensitivity, it is recommended to combine chaining with gradual exposure procedures (e.g., initially holding the toothbrush in the mouth for 2–3 seconds and progressively increasing duration; using toothpaste with a neutral flavor and introducing new toothpaste only after skill stabilization). To enhance independence, visual checklists or sequential cue cards (e.g., "1–2–3") as well as temporal supports (sand timers or digital timers) may be beneficial.

Dressing represents a category of skills in which the action sequence is highly context-dependent (e.g., season, type of clothing) and places substantial demands on fine motor coordination. Nevertheless, empirical studies indicate that both forward and backward chaining can improve the acquisition of specific dressing components. For example, Lee et al. reported significant improvements in dressing skills among participants when chaining procedures were implemented in both forward and backward sequences [11, pp. 178-192]. Recent research within the ABA framework further emphasizes the benefits of combining chaining procedures with training aimed at increasing fluency (accuracy and speed) in composite dressing tasks, which may reduce escape-maintained behavior associated with task duration and difficulty [see, for example, findings on composite task fluency training in dressing skills reported in 2023 studies; 20, pp. 316-322].

In practice, it is advisable to begin with the most frequent and functionally meaningful dressing components, such as putting on and taking off outerwear, putting on a T-shirt, fastening a zipper, turning sleeves right-side out, and selecting appropriate socks. When planning difficulties are evident, it is important to standardize the environment: clothing can be laid out in the same order each time, visual "front/back" markers may be used, and garments with simplified fasteners can be selected. If the child fatigues quickly, instruction should be delivered through brief instructional trials, with target independence achieved via the systematic reduction of physical prompting and the gradual increase of the prompt delay (time-delay procedures).

Toilet training has traditionally been considered one of the most sensitive and labor-intensive areas of intervention. On the one hand, toileting is underpinned by physiological processes; on the other, it comprises a chain of behavioral steps, including recognition of bodily signals, timely transition to the bathroom, clothing management, sitting, and hygiene routines. In school settings, effective programs have been described that incorporate scheduled toilet visits, time-limited sitting, immediate reinforcement contingent on successful outcomes, and the gradual extension of inter-visit intervals [13, pp. 60-64]. At the same time, contemporary systematic reviews note that many toileting interventions are grounded in behavioral principles and report predominantly positive outcomes; however, the overall quality and consistency of the evidence base remain heterogeneous and require further development [14].

When designing a toileting-related chain, it is important to distinguish between: (a) establishing continence (control over urination/defecation), and (b) teaching the toileting procedure itself (clothing management, sitting, hygiene, flushing, and subsequent handwashing). Behavior chaining is most directly applicable to the second component-namely, procedural routines. Historically influential work shaping behavioral toileting protocols includes the study by

N. H. Azrin and R. M. Foxx, which described an intensive rapid toilet training protocol [15]. In contemporary practice, emphasis has shifted toward individualized, ethically grounded, and family-centered programs that prioritize sensory comfort, functional communication, and the gradual increase of independence.

A practical example illustrates this approach: if a child can already sit on the toilet and complete some steps but experiences difficulty with clothing management, a separate sub-chain (e.g., “pull pants down / pull pants up”) can be isolated and taught using backward chaining, enabling the child to complete the terminal response independently and immediately access a reinforcing outcome (e.g., social praise, a token, or return to a preferred activity). It is essential to ensure privacy, teach hygiene skills in accordance with the child’s developmental level and sociocultural norms, and align the intervention plan with caregivers in advance.

Results and Discussion

Systematic data-based decision making is a defining feature of the behavioral approach. In chaining-based instruction, it is practical to use a stepwise checklist in which the level of assistance is recorded for each step (e.g., 0 = independent performance, 1 = verbal prompt, 2 = gestural prompt, 3 = partial physical prompt, 4 = full physical prompt). This format allows practitioners to identify which links in the chain are acquired more rapidly and which require additional instructional emphasis. A number of studies on behavior chaining document increases in the number of independently completed steps as prompts are systematically faded, providing a clear and objective indicator of progress [8, pp. 37-43].

Mastery criteria. Mastery criteria should be defined in advance and agreed upon with the family. In practice, a commonly used criterion is 80–90% of steps performed independently across 3–5 consecutive probes conducted on different days. For intimate skills (e.g., toileting and personal hygiene), mastery criteria may include not only correct sequencing but also quality of performance (e.g., “dry hands thoroughly,” “rinse soap off completely”).

After mastery criteria are met, it is essential to plan for maintenance. Selfcare skills are particularly susceptible to deterioration if they are performed for the child over extended periods or if contextual variables change (e.g., a new bathroom, a different type of soap). Therefore, recommended maintenance strategies include: (a) conducting periodic no-prompt probes; (b) retaining minimal visual supports; (c) reintroducing reinforcement if signs of regression emerge; and (d) training parents in a “least necessary assistance” approach to avoid inadvertently strengthening dependence.

Generalization - the transfer of skills across settings and people—is an obligatory instructional goal. To promote generalization, instruction should be conducted across multiple contexts (home, school, community settings), materials should be varied (e.g., different toothbrushes or soap dispensers), practice should involve different adults, and temporal delays between steps should be gradually increased. When learners rely on visual prompts, it is important to design “lightweight” versions suitable for public settings (e.g., a compact card or a brief checklist on a mobile device).

The effectiveness of behavior chaining increases when instruction is coordinated among all members of the support network, including teachers, special education professionals, caregivers, and parents. Reviews of evidence-based practices emphasize that successful outcomes depend not only on the selection of an appropriate procedure but also on the quality of implementation (treatment fidelity), consistency, and alignment with the child’s individual characteristics [1, pp. 178-182; 2, pp. 4013-4032; 3, pp. 16–17, 28-29, 77-78]. Within the family context, particularly important factors include clear and accessible instructions, the feasibility of delivering instruction in brief trials, and the establishment of realistic expectations.

From a cultural-historical perspective, behavior chaining may be conceptualized as a form of mediated learning, in which the adult structures the activity and provides support within the child's zone of proximal development. In this sense, prompts function as a means of temporarily reducing task difficulty to enable participation, followed by a gradual transition toward independence. This perspective facilitates the integration of behavior-analytic procedures with pedagogical principles of gradual progression, visual support, and collaborative engagement.

In applied practice, behavior chaining is effectively combined with other evidence-based tools. For example, visual supports may establish the order of steps, video modeling may demonstrate the execution of complex links, and brief social stories may clarify the purpose and expected outcomes of a skill (e.g., why handwashing is important or how to behave in a public restroom). In practice, these methods function synergistically: chaining supports step-by-step acquisition of behavior, while visual and conceptual supports enhance situational understanding and promote skill stability across contexts.

Instruction in self-care skills inherently involves considerations of privacy, bodily boundaries, and the child's dignity. Ethical standards require that adults promote the highest possible level of autonomy by providing assistance only to the extent necessary and transitioning as quickly as possible to less intrusive prompts. Physical prompting should be implemented with parental consent, consideration of the child's preferences, and adherence to safety requirements. During adolescence, it is particularly important to teach self-care skills in a manner that minimizes situations in which unfamiliar adults perform intimate tasks for the child, except when absolutely necessary.

Ethical considerations are also closely related to the selection of reinforcers and instructional demands. The use of shame or punishment as primary instructional tools is inappropriate. Instead, positive reinforcement, clear instructional structure, respectful communication, and sensitivity to the learner's sensory needs are strongly recommended. Contemporary evidence-based practice guidelines emphasize the importance of social validity and the adaptation of interventions to align with family values and the broader cultural context.

These findings underscore the importance of maintaining high implementation fidelity throughout the intervention. Even a well-designed behavior chain may fail to produce desired outcomes if prompts are delivered inconsistently, reinforcement is delayed, or steps are skipped. Therefore, practical supports such as concise instructional guidelines for adults, self-monitoring checklists, and periodic supervision by a qualified specialist are recommended to ensure consistent and accurate implementation.

Conclusion.

The present analysis demonstrates that behavior chaining represents a scientifically grounded and practice-oriented method for the development of self-care skills in children with autism spectrum disorder. A key strength of this approach lies in its capacity to transform complex daily living skills into sequences of manageable steps that can be taught systematically and measured objectively and subsequently consolidated under natural conditions. The combined use of task analysis, prompting and fading, carefully planned reinforcement, and generalization procedures creates conditions for meaningful increases in child independence and a reduction in family burden.

At the same time, the effectiveness of chaining procedures is contingent upon the quality of implementation and interdisciplinary collaboration. The most sustainable outcomes are achieved when instruction is embedded within daily routines, coordinated between home and school settings, and when instructional goals and mastery criteria reflect the actual needs of the child and family. Promising directions for future development include the expansion of parent training

programs, further research on socially significant daily living skills, and the integration of technological and visual supports that enhance independence and social inclusion for children with ASD.

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PEDAGOGICAL AND PSYCHOLOGICAL CHARACTERISTICS OF THE FORMATION OF CONTINUOUS PROFESSIONAL COMPETENCES IN TECHNICAL SCHOOL STUDENTS DURING THE EDUCATIONAL PROCESS

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Abstract. *This article presents a scientific investigation of the pedagogical and psychological characteristics underlying the formation of continuous professional competences among technical school students within the educational process. Particular attention is paid to the challenges of emotional and cognitive adaptation arising in the context of integration between educational institutions and industrial enterprises. Based on a comprehensive theoretical analysis, a "System of Continuous Professional-Psychological Development in Dual Education" was conceptualized, and its structural stages were systematically defined. The findings of the study indicate that the pedagogical proficiency of mentors, along with the development of students' social and psychological competences (soft skills), constitutes a key determinant of sustainable professional development.*

Keywords: *dual education, professional competence, continuity, pedagogical-psychological adjustment, mentor, technical school student, cognitive development.*

Introduction

In the context of the economic and social development of the new Uzbekistan, the rapid modernization of industrial sectors and the integration of the global labor market, the need for highly qualified, competitive and mid-level specialists who have mastered modern technological processes is growing at an unprecedented rate. In order to radically reform the vocational education system in the country, reshape its content and essence based on international standards and the real requirements of employers, advanced foreign experiences, in particular the dual education system of Germany, Switzerland and Great Britain, are being widely implemented.

The declaration of 2026 as the "Year of Training Youth in Modern Professions" at the initiative of the Head of State, as well as the widespread celebration of the "Vocational Education Day" on September 19, 2025 in cooperation with UNESCO and a number of international organizations, clearly demonstrate the priority and strategic importance of this direction at the level of state policy. The formation of professional competences within the framework of dual education is often implemented in a fragmented manner—separately within technical schools (primarily focused on theoretical assessment) and enterprises (primarily focused on production efficiency). Such an approach contradicts the fundamental principle of continuity in education.

In contemporary scientific discourse, competence is no longer interpreted as a mere arithmetic sum of acquired knowledge and mechanical skills; rather, it is conceptualized as the capacity to make independent and prompt decisions in complex and non-standard production situations, to demonstrate a strong sense of professional responsibility, to engage effectively in socio-communicative interaction within a team, and to exhibit professional creativity.

However, insufficient consideration of these psychological and pedagogical factors in the modernization of state educational standards and vocational training programs, as well as the lack of systematic psychological monitoring of students, significantly hinders the full socio-professional adaptation of graduates to workplace environments and corporate culture. In certain cases, this results in the emergence of early professional attrition syndrome.

Therefore, it is necessary to conceptualize the dual education process not as a mechanically divided system, but as a holistic and integrated pedagogical-psychological framework that establishes a cognitive, affective, and emotional bridge between theoretical academic instruction and practical production experience. The development of scientifically grounded strategies for fostering continuous professional competences among technical school students—aligned with both national socio-cultural characteristics and international standards—represents one of the most pressing challenges in contemporary vocational education pedagogy and labor psychology.

This article provides a comprehensive critical analysis of the identified problems, reveals the advanced pedagogical and psychological characteristics underlying the formation of continuous professional competences, and proposes innovative solutions to address these challenges. If we compare and analyze different theoretical approaches, in the Western (in particular, German and Swiss) approach, dual education is interpreted mainly from a pragmatic-economic point of view. In them, dual education is considered as a mechanism for providing the enterprise with a ready, specifically qualified workforce in the shortest possible time and reducing retraining costs, and the issue of the student's internal psychological adaptation is left to the employer's corporate culture. In domestic and CIS studies, a more person-oriented, humanistic and acmeological approach to the issue prevails. The common feature between foreign and domestic studies is that in both approaches, the harmony of theory and practice, the principle of learning through work (learning by doing).

A distinctive feature is the high assessment of the factor of upbringing, national mentality (the centuries-old traditions of "teacher-student") and spiritual and spiritual maturity in local pedagogical and psychological schools. Professor Sh.S. Sharipov, studying the issue of developing students' creative abilities in vocational education, comes to the following conclusion: "The formation of technical creativity and professional thinking in students is successful not only in training workshops, but also through psychological freedom in a real production environment and the correct pedagogical guiding activity of the teacher." In addition, one can cite the scientific conclusions of Professor K.T. Olimov on the psychological significance of educational and normative documents in modernizing the content of vocational education. As the scientist emphasized: “When developing the content of education and state educational standards, it is necessary to clearly define a system of competencies that guarantee the socio-psychological adaptability of a specialist to changing situations in the labor market, and to create objective criteria for their assessment”. Thus, competence is not only a technical standard, but also a psychological indicator.

In this article, based on the synthesis and generalization of various theoretical approaches, a structured matrix model was developed, revealing the step-by-step pedagogical and psychological features underlying the formation of professional competences in dual education.

These three stages constitute a unified spiral dynamic of development that ensures the continuity of the dual education process. While overcoming psychological barriers is of primary importance at the initial stage, the formation of psychomotor skills becomes the central focus at the intermediate stage, and the attainment of full socio-professional independence is achieved at the

final stage. The omission of any of these stages inevitably leads to a disruption in the continuity of the process.

Stage category	**Purpose in education and production**	**Psychological characteristics of the student**	**Formed continuous competence type**	**Distinguishing marks**
Cognitive-orientation (Adaptation)	To connect theoretical knowledge from the technical school with initial observations at the enterprise, to arouse interest in the profession and the work process.	Aversion to the corporate environment (stress and neophobia), a sense of dependence on a teacher-mentor, rapid fatigue of attention due to a strong flow of information.	*Information-analytical competence.* Mastering basic safety techniques and work discipline skills	In the process, mainly observation (receptive) and theoretical reproduction are prioritized. The independent movement of the student is severely limited.
Practical-operational (Reproductive action)	Step-by-step training to perform standard production operations correctly and without errors under the supervision of a mentor.	Increased professional self-confidence, acceleration of psychomotor reactions, and conscious struggle with the fear of making mistakes.	*Technological competence.* Independent work with devices and complex equipment, strict adherence to technological algorithms.	The student consciously combines theory and practice, and through repeated exercises, the skill becomes automatic. The mentor's supervision is reduced.
Reflective-evaluation (Creative-	Teaching independent decision-making in non-standard and problematic situations, involvement in team projects.	Professional identification (full realization of oneself as a real worker), taking responsibility, creative and	*Social-psychological and creative competence.* Teamwork, conflict management, and problem-	The highest level of independence. The mentor's role becomes that of a facilitator or advisor only, and the student becomes a full

independent)		critical thinking .	solving skills .	participant in the production.

The general theoretical conclusion derived from the analysis is that the formation of continuous professional competences in dual education is not confined to training students in the use of technological equipment; rather, it represents a complex pedagogical and psychological process that requires the systematic, purposeful, and continuous development of the learner's cognitive, emotional, and social domains. The theoretical significance of the study lies in the fact that these findings, together with the proposed system, provide a solid foundation for the emergence of a new interdisciplinary scientific direction in vocational pedagogy, defined as "educational psychology and andragogy in the enterprise." Furthermore, the categories identified through the analysis—Cognitive-orientational, Practical-operational, and Reflective-evaluative—are clearly conceptualized, with their scientific definitions and distinctive characteristics presented in the corresponding matrix. In addition, the deterministic (cause-and-effect) relationships between pedagogical conditions and internal psychological mechanisms within the dual education process have been identified and scientifically substantiated.

In traditional vocational education (mono-education), students acquire knowledge and skills primarily within an "artificial" or simulated environment, such as classrooms and training workshops. Under such conditions, their perceptions of the profession are often idealized or detached from real production contexts. As a result, upon entering the workplace after graduation, many students experience what is commonly referred to as "reality shock." This phenomenon reflects the discrepancy between theoretical preparation and the actual demands of production, including pressure, pace, and responsibility, which may negatively affect graduates' psychological well-being and professional confidence. In contrast to traditional behaviorist approaches to training—based on stimulus-response mechanisms—dual education conceptualizes the formation of professional competences not as the acquisition of mechanical skills, but as an active socio-constructive process. One of the most significant pedagogical and psychological features of dual education is that, from the early stages of training, the learner transitions from the passive role of a "student" to the active and responsible role of a "worker". The simultaneous enactment of these dual roles—learning and working—requires a high level of emotional intelligence, cognitive flexibility, and stress resilience. In the absence of continuity within this process, learners may experience confusion and disorientation due to the conflicting demands of academic and production environments.Theoretical analysis indicates that ensuring the continuity of professional competences in dual education is directly dependent on the pedagogical competence and psychological preparedness of enterprise mentors. For effective pedagogical and psychological adaptation, mentors must be able not only to demonstrate "how to perform a task," but also to explain "why it should be performed in a particular way," thereby fostering understanding of motivation, safety considerations, and cause-and-effect relationships.

Constructive feedback—focused on task performance rather than personal attributes—combined with timely encouragement, plays a crucial role in developing students' intrinsic motivation. This supports the theoretical positions of both international and national scholars, who emphasize that corporate socialization is most effective when grounded in positive reinforcement and pedagogical empathy. In this context, the mentor should operate within the learner's "zone of

proximal development," as conceptualized by Lev Vygotsky, providing appropriate scaffolding to facilitate progressive professional growth. Another important psychological feature of the formation of continuous professional competencies in dual education is the transfer of knowledge (i.e., the transfer of knowledge from one situation to another). The student must be able to transfer the theoretical knowledge acquired in the technical school (for example, the laws of thermodynamics, the basics of drawing, the resistance of materials, chemical reactions) in accordance with the specific and real technological processes in the enterprise. Practice shows that in many cases, students can master the theory perfectly in written or oral exams, but cannot apply it in practice in front of a noisy machine, under stress and lack of time. The main psychological reason for this is that in the technical school, knowledge is given in a declarative form (what I know, facts and rules), while in the enterprise it is required to immediately transfer it to a procedural form (how to do it, sequence of actions). In order for this transition to be continuous and cognitively smooth, it is recommended that technical school teachers (theorists) and enterprise mentors (practitioners) develop curricula and daily lesson plans together, in parallel and in accordance with each other. For example, when the topic "Crystal lattices of metal" is covered in the technical school, the next day at the enterprise a practical assignment on welding or turning on the same topic will prevent cognitive dissonance and confirm the deep consolidation of competence. Such processes of internalization and exteriorization of knowledge assimilation ensure the continuous development of competence. The scientific and practical significance of the study lies in the fact that the implementation of the proposed theoretical approaches contributes to a substantial improvement in the quality of didactic-integration mechanisms between technical schools and industrial enterprises. In particular, according to state educational reforms, beginning from the 2024/2025 academic year, it is planned to develop and implement over 100 new professional standards based on the advanced experience of Germany, Switzerland, and the United Kingdom. Within this context, it is recommended that these standards incorporate not only technical performance indicators (such as operational speed and product quality), but also socio-psychological and creative competences—such as communication skills, time management, stress resilience, teamwork, and adaptability—as essential and mandatory criteria. The rationale for this approach is grounded in the realities of the Industry 4.0 era and the processes of globalization, where employers increasingly prioritize not only narrow technical qualifications (hard skills), but also a high level of socio-psychological adaptability and interpersonal competence (soft skills). In this regard, dual education represents a unique pedagogical environment in which both categories of competences are formed continuously, organically, and in parallel, ensuring the holistic professional development of future specialists. Let us explain in detail how and in which processes the results of the analysis can be used:

Firstly, it is recommended to employ psychological testing and professional diagnostic methods during the admission of technical school students to dual education programs, as well as during their initial professional selection at the beginning of the academic year. This approach enables the identification of students' psychophysiological characteristics, including nervous system type and predisposition to specific forms of labor activity (e.g., routine, monotonous tasks or dynamic tasks requiring creativity and rapid decision-making). Such alignment contributes to more effective professional orientation and helps prevent early career mismatch and workforce inefficiency.

Secondly, the scientific conclusions presented in this study may serve as a methodological foundation for organizing short-term, intensive training programs in "Professional Psychology,

Andragogy, and Youth Pedagogy" for enterprise mentors on a regular basis. Only a mentor who is capable of accurately assessing a student's psychological profile and applying an individualized pedagogical approach can effectively unlock the learner's latent potential and ensure the sustainable and healthy development of professional competences.

Thirdly, these approaches can be effectively applied in modernizing the assessment paradigm within vocational education systems. In newly introduced digital platforms for evaluating professional qualifications and competences, it is advisable to complement traditional end-of-semester assessments with an "Electronic Portfolio of Continuous Competence Development" (e-portfolio). This tool enables a systematic evaluation of students' ongoing psychological adaptation to the workplace, labor discipline, teamwork, initiative, and their ability to constructively resolve problem situations. Furthermore, within the dual education process, the development of students' capacity for independent learning, critical analysis of personal practical experience, and reflective thinking is of paramount importance. In this regard, maintaining a reflective diary of daily workplace activities—where learners document what they have learned, identify errors in technological processes, reflect on the support received from mentors, set goals for improvement, and address personal challenges—facilitates the conscious and responsible regulation of their learning activities. This process activates mechanisms of self-regulation and self-management.

Conclusion. It is through such continuous cognitive-reflective integration of theoretical academic knowledge and practical production experience that professional competence evolves from an external requirement into an internalized personal quality, thereby ensuring its stability and sustainability.

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THE IMPORTANCE OF NATURAL SCIENCES IN DEVELOPING CREATIVITY AMONG PRIMARY SCHOOL TEACHERS

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Abstract. *This article highlights the role and importance of natural sciences in developing creativity among primary school teachers. It is substantiated that teaching natural sciences enhances creative thinking, problem-solving skills, and independent decision-making abilities. The study also analyzes methods of fostering a creative approach through modern pedagogical technologies. The findings of the research contribute to improving the professional competence of teachers in primary education.*

Keywords: *didactic approaches, abundance of ideas, experiences, observations, and collaborative discussions.*

Introduction

The primary education system is regarded as a foundational stage that ensures learners' success in subsequent levels of education, as well as the formation of their scientific worldview and problem-solving culture. In particular, the content of natural sciences enhances young learners' observational skills, causal reasoning, the ability to draw evidence-based conclusions, and motivation for learning through practical experimentation.

However, in 21st-century education, the mere transmission of knowledge is no longer sufficient; fostering students' creative thinking, organizing activities aimed at generating and testing new ideas, has become one of the key requirements. Creativity, in turn, does not emerge spontaneously. It is developed through purposeful didactic approaches, teaching methods, learning environments, assessment practices, and a culture of reflection.

Therefore, it is essential to develop in prospective primary school teachers the competencies to organize lessons using methods that foster creativity in natural science classes, to perceive creativity as a pedagogical objective, to adapt lesson design accordingly, and to engage students in the process of "discovery" (UNESCO, 2015).

In scientific literature, creativity is often interpreted as the ability to generate novel and valuable (useful, appropriate, and socially acceptable) ideas; it encompasses such components as divergent thinking, problem sensitivity, hypothesis generation, a willingness to take risks and learn from errors, experimentation, and the ability to justify one's ideas. In the context of practical education, creativity is not limited to the mere "abundance of ideas," but also includes the application of ideas to real-life situations, their verification through experimentation, analysis of results, and subsequent cycles of refinement and improvement.

In primary science education, this is manifested, for example, through questions such as "Why do leaves turn yellow in autumn?", "Why does ice float on water?", and "Why are some objects attracted to magnets while others are not?", which guide students toward observation,

experimentation, modeling, and explanation. Therefore, when planning creative lessons, a prospective teacher should strive not merely to compile a set of engaging activities, but to design learning experiences that reveal the fundamental logic of scientific inquiry.

One of the effective ways to develop creativity in primary education is to strengthen the learner's role as an active subject of cognition based on the constructivist approach. In this context, knowledge is not delivered in a ready-made form; rather, learners "construct" understanding through their own experiences, observations, and collaborative discussions. Constructivist didactics recommends organizing the lesson as a последовательный process that begins with a problem situation, followed by eliciting students' hypotheses, gathering evidence, and arriving at conclusions.

This process naturally stimulates creative thinking, as at each stage learners propose their own ideas, justify them, and engage in discussion. In particular, Lev Vygotsky's concept of the "zone of proximal development" serves as an important methodological foundation for prospective teachers. Through guiding questions, prompts, modeling, and collaborative activities, the teacher supports learners in accomplishing tasks slightly beyond their current level of competence. Such pedagogical scaffolding also fosters creativity, as students move closer to independent problem-solving while receiving appropriate support at critical moments.

Within the framework of developing creative abilities, the first important direction for prospective teachers is mastering problem posing and problem-based learning methods. In problem-based instruction, the teacher does not lead students directly to ready-made answers; instead, they organize the stages of understanding the problem, breaking it down into components, formulating hypotheses, collecting evidence, and testing these hypotheses.

The content of natural sciences is particularly suitable for creating problem situations: through simple experiments, observation of natural phenomena, and everyday "why?" questions, problems emerge naturally. For example, in answering the question "Why does a wet towel dry faster in the sun but more slowly in the shade?", students discover factors such as temperature, airflow, and evaporation. The teacher, in turn, creates opportunities for students themselves to propose the conditions of the experiment.

Problem-based learning fosters creativity in two ways: on the one hand, through divergent thinking (generating multiple hypotheses), and on the other hand, through convergent thinking (selecting the most substantiated solution) (Ellis Paul Torrance, 1974).

The second direction involves developing a culture of questioning and designing teacher questions in a way that stimulates creativity. If classroom questions are limited to "yes/no" responses or mere recall of facts, the psychological space for creativity becomes restricted. Therefore, prospective teachers should employ higher-order questions such as "How can…?", "What would happen if…?", "Under what conditions…?", "Do you think there is another way?", and "How would you prove the result?", as well as teach students to formulate their own questions.

In this regard, Benjamin Bloom's taxonomy provides a useful framework for structuring questions according to levels of complexity: progressing from understanding and application to analysis, evaluation, and creation supports the development of creativity (Bloom, 1956). For example, instead of asking "List the three states of water" (recall), a more creativity-oriented question would be "Design an experiment to determine under which conditions water evaporates more quickly," which encourages inquiry and exploration.

The third direction involves organizing experiments and practical activities in a manner that is age-appropriate, safe, and goal-oriented. In natural science lessons, creativity often emerges

through the design of experiments. Learners determine what tools are needed to test their hypotheses, which variables should be controlled, and how results should be measured and recorded. This process represents a simplified form of the scientific method and fosters the development of scientific literacy as well as the initial skills of creative engineering thinking.

The inquiry-based learning approach is specifically grounded in this process. Within this framework, students ask questions, formulate hypotheses, test them, analyze results, and defend their conclusions through communication. Prospective teachers should learn to structure experiments not as fixed "instructions," but as a "discovery laboratory." For example, leaving multiple pathways open to achieve the same outcome, comparing different student-designed approaches, and even analyzing "incorrect" results. Indeed, the analysis of errors activates a crucial component of creativity-metacognitive reflection.

The fourth direction focuses on developing creative collaboration and communicative competencies. Creativity is often enhanced within social processes, through the exchange of ideas and collective discussions. Primary school students, by working in groups, learn to compare observational results, express their thoughts in simple language, provide evidence, and listen to others. A prospective teacher should perceive group work not as mere "noise," but as structured scientific communication, ensuring clear role distribution (observer, recorder, presenter, materials manager), effective time management, and well-defined assessment criteria. In this process, creating a socio-psychological environment that fosters creativity-such as a safe atmosphere, respect for all ideas without ridicule, and maintaining an "idea bank"-is of particular importance.

The fifth direction involves strengthening creativity through an integrative (interdisciplinary) approach. Connecting natural science lessons with language arts (text construction, explanatory writing), mathematics (measurement, tables, diagrams), visual arts (models, drawings), and technology (simple devices) enhances students' ability to transfer knowledge across domains, which is a key indicator of creative thinking.

In contemporary education, the STEAM (Science, Technology, Engineering, Arts, Mathematics) approach systematically promotes such integration. Within this framework, students solve problems using scientific concepts and engineering design, while presenting results in aesthetically and communicatively meaningful ways (Yakman, 2008). At the primary education level, STEAM does not require complex technologies. For example, simple projects such as "Building a bridge model" (using paper, sticks, and string) or "Water filtration" (using sand, cotton, and gravel) can effectively foster interdisciplinary creative activity.

In conclusion, the development of creativity in the process of teaching natural sciences largely depends on the teacher's methodological approach. Meaningful questioning, hands-on experimentation, inquiry-based activities, and a collaborative learning environment contribute to the formation of students' independent thinking and their ability to generate innovative ideas. Furthermore, an integrative approach based on STEAM expands opportunities for applying knowledge across different disciplines, thereby further enhancing creative thinking.

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CORRECTIVE-PEDAGOGICAL MECHANISM FOR SPEECH DISORDERS IN CHILDREN WITH VISUAL IMPAIRMENTS

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Abstract. *The given article presents the psycho-corrective and correctional-specific mechanisms of speech development in blind children, along with a comparative analysis of various scholars' views. It also highlights that overcoming speech disorders in blind children should be carried out through the integrated unity of pedagogical, psychological, and corrective approaches.*

Keywords: *correction, sensory, tactile, verbal, play activity, expressive, motor skills, perception, sensation.*

Introduction

In students with visual impairments, the formation of sensation, perception, and imagination is extremely complex. In this context, it is necessary to clarify the concept of sensation. A person perceives surrounding objects and phenomena through hearing, vision, smell, taste, and tactile sensations. In children with visual impairments, the function of vision is compensated by other sensory organs. A blind child primarily perceives surrounding objects and events through tactile sensations, especially by using their hands. These sensations help them form perceptions of objects.

The corrective basis of speech in blind children refers to a scientifically grounded system aimed at eliminating secondary deficiencies in speech development that arise due to impairment of the visual analyzer. Speech therapy correction is directed at developing all components of speech in blind children. This includes forming correct pronunciation, identifying and enriching vocabulary, improving grammatical structure, and developing coherent speech. In conducting corrective speech therapy work, it is essential to take into account the internal capabilities of blind children.

Children with visual impairments do not have a complete understanding of objects and phenomena in their environment. As a result, they often acquire many words and expressions mechanically, without understanding their meaning or being able to connect them with practical experience. Therefore, in corrective sessions, special attention is given not only to developing knowledge and skills but also to fostering positive emotional attitudes. This allows children to feel confident and comfortable. Special corrective sessions help improve the processes of education, upbringing, vocational guidance, preparation for work, and adaptation to independent life for children with visual impairments. The main goal is to prepare them to perceive educational material in general education classes and to engage in independent activities.

Purpose of the Study: To study and analyze the corrective-pedagogical aspects of speech deficiencies in blind children**.**

Objectives of the Study:

Corrective-pedagogical work carried out with children with visual impairments addresses the following tasks:

- Developing skills for the proper use of residual vision;
- Teaching how to obtain information about the surrounding world through all preserved analyzers;
- Teaching how to use the acquired polysensory information in subject-practical, cognitive, and communicative activities, as well as in spatial orientation.

Additionally, one of the most important tasks of corrective sessions is to develop socially adaptive behavior skills in children. This enables them to be independent and sufficiently active in daily life, social situations, and communication with peers and adults.

Relevance of the Topic: At present, in the fields of special pedagogy and speech therapy, the development of speech in blind and visually impaired children is an актуal scientific and practical issue. The specific characteristics of speech in blind children necessitate the development of special corrective-pedagogical mechanisms, the improvement of their theoretical foundations, and the identification of effective methods and technologies. Speech therapy intervention is carried out through a комплекс of generally accepted methods practical, visual, and verbal approaches. To prevent the formation of purely verbal representations, verbal methods are used in combination with visual and practical methods. Since play activity develops more slowly in this category of children, speech therapy sessions are organized in a play-based format using game materials. Didactic and visual materials are selected with consideration of the children's visual pathology.

Level of Study of the topic: Collaboration among speech therapists, typhlopedagogues, and medical professionals makes it possible to teach children to perceive information about the environment through preserved analyzers. As a result, their speech gains clearer content, becoming more vivid and enriched.

Pedagogical, Psychological, and Corrective Features of Eliminating Speech Disorders in Blind Children: A Comparative Analysis with International Research

Direction	**National (Local) Approaches**	**International Research and Practice**	**Common and Distinguishing Features**
Pedagogical Approach	Education in specialized schools and classes relying on oral speech; sensory compensation (hearing, tactile sense)	Inclusive education prioritized in US and European studies; multisensory approach (auditory, tactile, kinesthetic) widely used	Common feature – sensory compensation; Difference – international experience emphasizes inclusion and broader use of technologies |
Educational Tools	Braille, audio materials, object-based lessons	Braille + digital assistive technologies (screen readers, audiobooks, interactive programs)	International experience shows wider technological opportunities
Vocabulary Development	Teaching words by	Development through experiential language	Methodological foundations are similar;

	linking them with objects and actions	learning and real-life situations (research by Hatwell, Warren)	contextual richness is stronger in international experience |
Psychological Approach	Emotional support, creating positive motivation	International studies apply self-efficacy and social-emotional learning (SEL) concepts	Goal is the same; theoretical foundation is deeper in international experience |
Communication Skills Development |	Conversations, role-playing, individual lessons	Social stories and group training in the USA and Scandinavian countries	Social integration is stronger in the international approach
Speech Correction and Therapy	Individual speech therapy sessions, correcting sound pronunciation	Early intervention and multidisciplinary teams (speech therapist, psychologist, teacher for visually impaired) in international practice	Early diagnosis is prioritized in international experience
| Articulation Exercises	Tactile-articulation exercises, work on breathing and voice	Sensorimotor approach applied based on scientific evidence (research by ASHA)	Methods are similar; scientific standardization is stronger in international experience
Phonemic Hearing	Exercises based on auditory analysis	Development of phonological awareness considered a key factor in international studies	Content is similar; terminological differences exist
Connected Speech	Story creation, retelling	Narrative competence concept widely applied in international approach	Approaches are similar in content
Assessment of Effectiveness|	Observation and pedagogical diagnostics	Standardized tests and monitoring systems in international practice	Assessment mechanisms are more defined in international experience

Analysis Results:

The analysis shows that although national and international approaches to eliminating speech disorders in blind children are methodologically similar, international practice demonstrates a higher level of implementation of inclusive education, early intervention, multidisciplinary approaches, and the use of assistive technologies. Adapting these practices to the national education system can ensure more effective speech development in blind children.

Methods:

1. Identification and analysis of literature related to the topic;

2. Study of the psychological aspects of the topic;
3. Observation;
4. Comparative analysis.

Speech development in children with visual impairments has specific characteristics, directly affecting their cognitive activity, perception of the environment, and social adaptation processes. Speech disorders in blind children are often explained by limited sensory experience, insufficient formation of visual representations, and the passivity of speech activity. Therefore, addressing speech disorders in this category of children should be carried out through the integrated unity of pedagogical, psychological, and corrective approaches.

From a pedagogical perspective, the educational process for blind children requires a specially organized environment. In this process, the deficiency of the visual analyzer is compensated by other analyzers—hearing, tactile, and kinesthetic sensations. In teaching, explanations based on oral speech, object-based activities, tactile perception of objects, and linking words and concepts with real actions are of great importance. Pedagogical work is aimed at the systematic development of all components of speech—vocabulary, grammatical structure, sound pronunciation, and coherent speech.

Levels of Speech Development in Children with Visual Impairments *(According to L.S. Volkova)*

First Level: Expressive speech does not perform a communicative function and is extremely limited. There are significant difficulties in linking words with object images and generalized concepts. Coherent speech consists of isolated words. Echolalia is observed. The processes of phonemic analysis and synthesis are not fully developed.

Second Level: Expressive speech is characterized by limited vocabulary. The connection between words and object images, as well as the understanding of generalized concepts, is at a low level. Coherent speech is agrammatical and consists of enumerations and one- or two-word sentences. There are numerous sound pronunciation disorders. The ability to distinguish sounds by hearing and pronunciation is insufficiently developed. Phonemic analysis and synthesis are poorly developed.

Third Level: Active vocabulary is limited. Errors occur in matching words with object images, in the use of generalized concepts, grammatical categories, sentence construction, and in producing extended narratives. Sound pronunciation is impaired. The differentiation of sounds by hearing and pronunciation, as well as phonemic representations, are insufficiently developed.

Fourth Level: Isolated (single) sound pronunciation disorders are observed.

Psychological Aspects: From a psychological perspective, speech disorders in blind children are often closely related to emotional state and personal development. Visual impairment can lead to lack of self-confidence, withdrawal from communication, and decreased speech activity. Therefore, psychological support is an essential condition for speech development. By fostering positive motivation, strengthening the need for communication, and ensuring emotional stability, it is possible to activate speech activity. Activities based on play, conversation, and social situations are considered effective psychological tools.

Classification of Children with Visual Impairments:

1. Children who are congenitally blind or who became blind or visually impaired before the age of three due to various negative factors;
2. Children who acquired visual impairment after the age of three.

The main criterion for such classification is the extent of life experience and visual representations the child accumulated during the period of normal vision (if such a period existed).

Difficulties in Developing Communication Skills: Visual impairment limits social interactions and hinders the development of communication experience with peers and adults. Children may have difficulty recognizing interlocutors and understanding their emotions through facial expressions. They also struggle to adequately express their own emotions. The use of nonverbal means of communication facial expressions, gestures, and intonation—is often weak. As a result, speech becomes less expressive and requires special corrective work. These difficulties are especially pronounced in children with total or severe visual impairment.

Corrective Speech Therapy Work: Corrective-logopedic work is planned individually depending on the type and severity of speech disorders in blind children. The corrective process includes correcting sound pronunciation, developing phonemic hearing, forming lexical-grammatical structures, and developing coherent speech. Special attention is given to tactile-articulatory exercises, tasks based on auditory analysis, and work on speech breathing and voice. The effectiveness of corrective work increases when it is carried out in harmony with pedagogical and psychological approaches.

Continuity of Corrective Sessions: The continuity of corrective sessions is an important factor in working with visually impaired children within an educational cluster environment. This means that the educational process should be continuous and uninterrupted, as only in this way can children gradually acquire new knowledge and skills. Corrective sessions should be individualized and adapted to each child's needs and level of development. Therefore, it is important first to diagnose each child's developmental level and determine the necessary knowledge and skills.

In addition, the use of various teaching methods and technologies that help visually impaired children better understand educational material is of great importance. For example, audio and video materials, tactile cards, computer programs, and special technologies increase the effectiveness of the learning process. Cooperation with speech therapists, psychologists, and other specialists within the educational cluster also plays a key role in ensuring continuity of education. Such an approach improves the development of visually impaired children and enables their full participation in the educational process.

Children with visual impairments face certain difficulties in the learning process. The absence or limitation of visual perception and communication challenges complicate their learning. Therefore, adhering to the principle of continuity in corrective sessions is especially important. When developing educational programs, it is necessary to take into account children's existing knowledge, skills, and previous learning experiences.

- Developing skills for the effective use of residual vision;
- Teaching how to obtain information about the surrounding world through all preserved analyzers;
- Teaching how to use the acquired polysensory information in subject-practical, cognitive, and communicative activities, as well as in spatial orientation.

In addition, one of the most important tasks of corrective sessions is to develop socially adaptive behavior skills in children. This enables them to be independent and sufficiently active in daily life, social situations, and communication with peers and adults.

Conclusion. In conclusion, the process of eliminating speech disorders in blind children requires a comprehensive approach. The interconnection and systematic organization of

pedagogical, psychological, and corrective work serve as key factors in ensuring children's speech development, as well as their social adaptation and personal growth.

At present, many teachers widely use classical individual lessons and small group sessions in their practice, as they provide an effective individualized and differentiated approach. This is very important in corrective-pedagogical work; however, in addition to these forms, significant attention is also given to integrated lessons. Today, integration is considered one of the effective ways to improve the quality of education, modernize it, and support the development of the child's personality, as well as preserve and strengthen their health. Integrated sessions focus on overall development rather than isolated processes. They help develop communication skills, motor activity, cognitive engagement, speech, spatial orientation, fine and gross motor skills, imagination, memory, and attention.

In recent years, approaches based on modern information and communication technologies have also been widely introduced in the development of speech in blind children. Audio materials, voice-based programs, electronic resources based on Braille, and special speech-development applications significantly increase the effectiveness of the corrective process.

This approach supports the development of independent work, listening comprehension, and speech activity in children, and serves as a complementary tool to traditional methods. Overall, current approaches to correcting speech deficiencies in blind children are comprehensive, systematic, and personality-oriented in nature. These approaches are based on the child's sensory capabilities, activity, and individual characteristics, and they ensure the effectiveness of the corrective-pedagogical process.

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ENHANCING THE PROFESSIONAL COMPETENCIES OF TEACHERS IN THE PROCESS OF IMPLEMENTING INCLUSIVE EDUCATION IN UZBEKISTAN

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Abstract. *The article is devoted to a comprehensive analysis of the problem of formation and development of professional competencies of teachers in the conditions of expanding the inclusive educational space. Based on the analysis of domestic and foreign studies, the key components of professional readiness of teachers are identified, a comparative analysis of statistical data reflecting the level of formation of inclusive competence is carried out. Systemic contradictions between the requirements of educational policy and the actual level of training of pedagogical personnel are substantiated. Directions for improving the effectiveness of professional development of teachers based on the integration of theoretical, practical, and value-based training are proposed.*

Keywords: *inclusive education, professional competence, teacher, educational environment, special educational needs, pedagogical activity.*

Introduction

In the context of the global transformation of educational systems, inclusive education is acquiring the status of not only a pedagogical technology but also a socio-cultural mechanism for ensuring equal opportunities for all categories of students. It is widely recognized that the concept of inclusion is based on the recognition of the uniqueness of each child and the need to adapt the educational environment to their individual characteristics. International normative documents, including the UNESCO Salamanca Declaration, emphasize that educational systems should focus on the diversity of learners rather than on their uniformity [1].

In the Republic of Uzbekistan, the implementation of inclusive education is considered a strategic direction for the modernization of the education system. However, the success of this process is largely determined by the level of professional readiness of teachers, as they are the direct agents of implementing educational policy. Modern scientific research indicates that the professional competence of teachers in inclusive education is a complex, multi-component structure. Within the competency-based approach (T.I. Shamova), it is viewed as the teacher's ability to effectively solve professional problems in a variable educational environment [3]. Important factors include not only knowledge, but also the ability to translate it into practical activities.

It should be pointed out that research by S.V. Alekhina notes that inclusive competence of teachers includes a willingness to embrace the diversity of learners, the ability to adapt the educational process, and the ability to build interactions with participants in the educational

environment [2]. A.A. Margolis shares a similar position, emphasizing the need to develop teachers' skills in individualizing learning and designing educational pathways [4].

The findings demonstrate that the theoretical development of this issue, an analysis of empirical data shows that teachers' readiness to implement inclusive education remains insufficient. For example, a study involving more than 16,000 teachers indicates that approximately 70% of professionals' experience difficulties working in an inclusive environment [5]. It is important to note that more detailed data confirms this trend. Specifically, studies of preschool education have found that only 4% of teachers demonstrate a high level of professional readiness, while 46% have a low level, and 50% have an average level [6]. These figures indicate a significant gap between regulatory requirements and the actual state of professional training of teaching staff.

Statistical analysis allows us to identify the structure of professional deficiencies. The most pronounced difficulties are associated with the practical aspects of teaching. Thus, approximately 75% of teachers' experience difficulties adapting educational material, 68% experience difficulties developing individual educational pathways, and 60% experience difficulties organizing interactions with children with special educational needs [7; 8].

These data indicate the prevalence of theoretical training over practical training, which reduces the effectiveness of teaching. In this regard, the need for a transition to a practice-oriented model of teacher training is becoming more pressing. It is necessary to highlight that structural analysis of teacher professional competence in an inclusive education setting allows us to identify several interrelated components. The cognitive component encompasses a system of knowledge about children's psychophysical development, the characteristics of various categories of students, and methods of correctional and developmental work. The practical component reflects the teacher's ability to design the educational process, including adapting learning content and using differentiated technologies.

The communicative component involves developing skills for effective interaction with students, parents, and support specialists. Of particular importance is the value-motivational component, which determines the teacher's attitude toward the ideas of inclusion and their readiness for professional development [2; 4]. The interdisciplinary aspect of pedagogical activity deserves special attention. Inclusive education requires the participation of various specialists, including psychologists, speech therapists, and special education teachers. Research shows that without teamwork, the effectiveness of the educational process decreases by an average of 25-30% [9].

It is generally accepted that analysis of scientific literature allows us to identify the main factors hindering the development of teachers' professional competence. These include: insufficient practical training, limited access to methodological resources, high professional workload, and the presence of psychological barriers. In particular, teachers often lack confidence in their professional capabilities, which reduces their commitment to implementing inclusive practices [7].

The institutional environment is also an important factor. The lack of systemic support from educational institutions leads to decreased teacher motivation and limits their opportunities for professional growth. It can be observed that overcome the identified problems, it is necessary to develop a comprehensive system for the professional development of teachers. This system should include the following areas:

– developing professional development programs focused on the practical application of inclusive technologies;

– implementing training-based learning experiences aimed at developing professional skills;

– establishing methodological centers and resource platforms;

– developing a mentoring and professional support system;

– forming professional communities of teachers.

According to research, the introduction of practice-oriented learning approaches can increase teachers' professional readiness by 25–30% [5]. This confirms the effectiveness of the transition to a new model of professional training. Developing an inclusive culture within educational institutions is of particular importance. Inclusion requires changing values and fostering a respectful attitude toward the diversity of students. In this context, management plays a crucial role, ensuring the creation of favorable conditions for teachers' professional activity [8].

It is relevant to state that the conducted analysis allows us to conclude that improving teachers' professional competencies is a key condition for the successful implementation of inclusive education.

Conclusion

The identified statistical patterns and theoretical propositions indicate the need for a systemic modernization of teaching staff training. The development of professional competence should be based on the integration of theoretical training, practical skills, and values. It is significant to mention that only with a comprehensive approach is it possible to create an effective inclusive educational environment that ensures equal opportunities for all students.

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PEDAGOGICAL AND ORGANIZATIONAL CAPABILITIES OF ARTIFICIAL INTELLIGENCE

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Abstract. *This article presents an in-depth scientific analysis of the pedagogical and organizational capabilities of artificial intelligence (AI) technologies within modern education systems. The study explores how AI contributes to the personalization of learning, improvement of teaching efficiency, and enhancement of data-driven decision-making in educational institutions. Special attention is given to adaptive learning platforms, automated assessment systems, and intelligent analytics for monitoring educational quality. Furthermore, the research examines the challenges associated with AI implementation, including insufficient technological infrastructure, limited digital competencies of teachers, and issues related to data security and ethics. The findings indicate that while AI technologies significantly improve educational outcomes and management efficiency, their successful implementation requires a comprehensive and systematic approach.*

Keywords: *artificial intelligence, adaptive learning, digital education, educational management, learning analytics, pedagogical innovation.*

INTRODUCTION

The rapid development of information and communication technologies, along with the ongoing global digitalization process, is fundamentally transforming the education system. Traditional approaches to teaching and learning are increasingly insufficient in meeting the demands of a knowledge-based society characterized by rapid information growth and changing skill requirements. In this context, artificial intelligence (AI) technologies have emerged as one of the most significant drivers of innovation in education. AI enables the automation of complex processes, supports personalized learning experiences, and enhances the efficiency of both teaching and administrative activities.

Artificial intelligence can be defined as a set of computational technologies that simulate human cognitive processes such as learning, reasoning, problem-solving, and decision-making. In educational environments, AI systems can analyze large volumes of student data, identify patterns in learning behavior, and generate individualized learning pathways. Globally, many countries are actively integrating AI into their education systems through digital platforms, intelligent tutoring systems, and automated assessment tools. These technologies not only improve learning outcomes but also reduce the workload of teachers and enhance the transparency of educational processes.

In the Republic of Uzbekistan, the modernization and digitalization of education have been identified as strategic priorities. National development programs emphasize the importance of integrating innovative technologies, including AI, to improve the quality and accessibility of education. Therefore, the scientific analysis of the pedagogical and organizational capabilities of

AI technologies is both relevant and necessary. This study aims to explore how AI can transform teaching practices and improve the management of educational institutions.

LITERATURE REVIEW

The integration of artificial intelligence into education has been widely studied in international research. Various scholars and organizations have examined its impact on teaching, learning, and educational management. According to UNESCO (2019), AI has the potential to address major global challenges in education, including improving access to quality learning and reducing inequalities. However, it also raises important ethical concerns related to data privacy and algorithmic transparency. Holmes, Bialik, and Fadel (2019) emphasize that AI enables the development of adaptive learning systems that adjust educational content based on individual learner needs. This represents a shift from traditional standardized instruction toward more flexible and personalized learning environments.

The OECD (2020) highlights the role of AI in enhancing decision-making processes in education. AI-driven analytics allow institutions to monitor performance, predict outcomes, and optimize resource allocation. In the context of Uzbekistan, G‘afforov (2022) discusses the importance of digital technologies in modern education but points out that there are still challenges related to infrastructure and teacher preparedness. Despite the growing body of literature, there remains a need for more detailed analysis of how AI technologies can be effectively integrated into specific educational contexts, particularly in developing countries.

RESEARCH METHODOLOGY

This research is based on a qualitative and analytical approach. The following methods were used:

- analysis of scientific and academic literature on artificial intelligence in education;
- comparative analysis of international and national practices;
- pedagogical observation of teaching and learning processes involving digital tools;
- synthesis and generalization of research findings.

The study focuses on identifying key trends, opportunities, and challenges associated with the implementation of AI technologies in education.

MAIN RESULTS

1. Pedagogical Capabilities of Artificial Intelligence

1.1 Personalized Learning

One of the most significant advantages of AI in education is the ability to provide personalized learning experiences. Traditional education systems often apply a uniform approach to all students, regardless of their individual abilities and learning styles.

AI-based adaptive learning systems analyze student performance and adjust the content accordingly. For example:

- students who struggle with a topic receive additional explanations and exercises;
- advanced learners are provided with more complex tasks;
- learning speed is adapted to individual needs.

This approach increases student engagement and improves academic outcomes.

1.2 Intelligent Tutoring Systems

AI-powered tutoring systems simulate one-on-one instruction by providing guidance, feedback, and explanations. These systems can operate continuously, allowing students to learn at their own pace without time constraints.

Such systems are particularly useful in:

- distance learning environments;
- large classrooms with limited teacher attention;
- supplementary education.

1.3 Automated Assessment

AI technologies enable the automation of assessment processes. This includes:

- grading of tests,
- evaluation of assignments,
- analysis of student responses.

The advantages include:

- saving teachers' time,
- ensuring objectivity,
- providing instant feedback.

However, limitations remain in evaluating creative and analytical tasks.

1.4 Learning Analytics

AI systems collect and analyze data related to student learning activities. These systems provide insights into:

- student performance,
- learning progress,
- behavioral patterns.

This allows teachers to identify students who need additional support and to intervene at an early stage.

2. Organizational Capabilities of Artificial Intelligence

2.1 Educational Management

AI technologies improve decision-making processes in educational institutions. By analyzing large datasets, administrators can:

- plan academic programs,
- allocate resources efficiently,
- monitor institutional performance.

2.2 Administrative Automation

AI can automate routine administrative tasks such as:

- scheduling classes,
- managing student records,
- generating reports.

This reduces workload and increases efficiency.

2.3 Strategic Planning

AI supports long-term planning by providing predictive analytics. Institutions can forecast:

- student enrollment trends,
- academic performance,
- resource needs.

3. Challenges of AI Implementation

Despite its benefits, the integration of AI in education faces several challenges:

3.1 Infrastructure Limitations

Many institutions lack the necessary technological resources.

3.2 Teacher Competence

Teachers may not have sufficient skills to effectively use AI tools.

3.3 Ethical Issues

Concerns include:

- data privacy,
- algorithmic bias,
- transparency.

3.4 Risk of Overdependence

Excessive reliance on AI may reduce human interaction and critical thinking.

DISCUSSION

The integration of AI into education represents a paradigm shift rather than a simple technological upgrade. It changes not only how students learn but also how teachers teach and how institutions operate. From a pedagogical perspective, AI transforms the role of the teacher from a knowledge provider to a facilitator and mentor. This requires new competencies, including digital literacy and the ability to interpret data generated by AI systems.

From an organizational perspective, AI introduces a data-driven culture in educational institutions. Decision-making becomes more evidence-based, but it also depends heavily on the quality and reliability of data. However, the success of AI integration depends on balancing technological innovation with human-centered education. AI should support, not replace, teachers.

CONCLUSION

Artificial intelligence technologies play a crucial role in the modernization of education systems. They enhance teaching effectiveness, support personalized learning, and improve the management of educational institutions. At the same time, successful implementation requires addressing challenges related to infrastructure, teacher training, and ethical considerations. A comprehensive and balanced approach is essential for maximizing the benefits of AI in education. Future research should focus on empirical studies and practical implementations to evaluate the real impact of AI technologies on educational outcomes.

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THE PROFESSIONAL COMPETENCE OF TEACHERS IN INCLUSIVE EDUCATION AND THE ROLE OF MOTIVATION IN STUDENTS' SOCIAL ADAPTATION

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Abstract. *This article analyzes the essence of the education system, its structural components, and the issues related to teachers' professional competence in the modern educational process. It scientifically examines the psychological and pedagogical aspects of working with children with disabilities in the context of inclusive education, highlights the importance of corrective-pedagogical activities, and substantiates the role of motivation in the social adaptation of students.*

Keywords: *education system, inclusive education, professional competence, pedagogical mastery, motivation, social adaptation, corrective-pedagogical activity, teacher personality, psychological support.*

Introduction

The modern education system represents a complex and dynamically evolving structure that continuously adapts to the social, economic, and spiritual needs of society. The effectiveness of this system largely depends on the coherence and integration of its core components, namely objectives, content, teaching methods, and pedagogical activities. In contemporary educational practice, particular emphasis is placed on ensuring that these elements function in harmony to achieve high-quality learning outcomes and the holistic development of learners.

In the context of inclusive education, the organization of the teaching and learning process becomes especially significant. It requires careful consideration of learners' individual characteristics, including their cognitive abilities, psychological features, and specific educational needs. Inclusive education aims to create equal opportunities for all students, including those with disabilities, by fostering an environment that supports participation, accessibility, and equity. Therefore, teachers must be capable of designing flexible instructional strategies, adapting curricula, and applying differentiated approaches to meet diverse learning needs.

This, in turn, places increased demands on teachers' professional competence, pedagogical mastery, and adaptability. A modern teacher is expected not only to possess strong subject knowledge, but also to demonstrate skills in communication, classroom management, psychological support, and the effective use of innovative teaching technologies. Moreover, the ability to collaborate with parents, specialists, and support staff plays a crucial role in ensuring successful inclusive practices.

At the same time, motivation emerges as a key factor in enhancing students' engagement, learning activity, and overall academic performance. In inclusive settings, motivation is particularly important for supporting students' self-confidence, encouraging active participation, and facilitating their social adaptation. By fostering both intrinsic and extrinsic motivation, teachers can create a supportive learning environment that promotes personal growth, social integration, and lifelong learning skills among students.

Its essence is reflected in the dynamic interplay of movement, activity, communication, interpersonal interaction, contradictions, discussion, comparison, thinking, knowledge, skills, competencies, behavior, and the formation and development of activity. These elements are interconnected and evolve through continuous interaction and, at times, through the resolution of contradictions, which ultimately contribute to the development of the individual within the educational process.

Russian tiflopedagogues, such as V.P. Ermakov and G.A. Yakunin, in their research on the functioning of educational institutions for children with disabilities, emphasize several important aspects. They note that the study of children with developmental impairments reveals key patterns that are also characteristic of typical child development. These include: a certain последовательность (sequence) of stages in psychological development; the presence of sensitive periods in the development of mental functions; the sequential formation of cognitive processes; the significant role of activity in mental development; and the crucial role of speech in the formation of higher mental functions. Furthermore, it is emphasized that education plays a leading role in mental development, as highlighted in the works of Lev Vygotsky and Vladimir Lubovsky. Their theoretical contributions underline the importance of guided learning, social interaction, and the cultural environment in shaping cognitive and psychological development, particularly in inclusive educational settings.

“A multi-level system of psychological and pedagogical support for students has been established in schools. This system represents a holistic, coordinated, and systematic activity of specialists aimed at creating socio-psychological and pedagogical conditions that ensure students receive quality education, achieve maximum self-awareness, and are prepared for successful social adaptation”. “The professional competence of a teacher is an integrated system of professionally significant personal qualities that ensure a high level of pedagogical activity, both in general and specialized education, as well as in practical experience. A high level of professional pedagogical activity is understood as its effectiveness in accordance with the level of modern science and the current demands of society”. “In recent years, numerous new concepts and forms of knowledge essential for a modern teacher have emerged. Concepts such as ‘excellence’ and ‘competence’ have been actively introduced into both scientific discourse and everyday practice, characterizing the appropriate level of a specialist’s professional qualification. Excellence can be defined as the teacher’s ability to act effectively under conditions of uncertainty. The higher the level of uncertainty, the more significant this ability becomes, as it enables the teacher to make informed decisions, adapt to changing educational environments, and respond flexibly to diverse student needs.”

Results

In order to successfully implement various innovations in practice and effectively carry out tasks under new conditions, a teacher must possess a sufficient level of professional mastery as well as a strong motivation to achieve success in their professional activity. Professional competence is not only a set of knowledge and skills, but also includes the teacher’s readiness for continuous development, adaptability, and responsibility for educational outcomes. One of the most important characteristics of professional competence is “attention to the child.” A teacher’s pedagogical orientation toward the learner is aimed at developing students’ motivation for learning, as well as their understanding of the surrounding world, other people, and themselves. This includes care, genuine interest, empathy, and support for the child’s personal development, enabling the fullest possible realization of their individuality and potential.

A professionally competent teacher can be described as one who demonstrates a sufficiently high level of pedagogical activity and communication, and who consistently achieves strong learning outcomes. Professional excellence, in this context, refers to the ability to adhere to established standards of professional behavior, including how tasks are performed and how initiative and responsibility are demonstrated. Competence reflects a complex outcome of activity, encompassing not only knowledge and skills, but also personal qualities such as responsibility, empathy, creativity, and resilience.

External pedagogical conditions include the use of diverse teaching methods and technologies, as well as the establishment of positive and supportive relationships between teachers and students. The development of the value-motivational sphere, along with the formation of knowledge, skills, and essential competencies among future specialists in the field of social work, plays a significant role in effectively working with children with disabilities. Pedagogical work is based on educational and upbringing programs implemented in educational institutions, on the basis of which special corrective programs are developed. Corrective-pedagogical work is aimed at:

- organizing specialized corrective interventions (such as the development of visual perception and spatial orientation, correction of impairments in other mental functions, exercise therapy, etc.);
- implementing corrective exercises during lessons (mathematics, speech development, drawing, physical education, labor training, etc.), as well as in games and everyday activities.

At the same time, as teachers gradually master their profession, they also promote pedagogical knowledge among parents. This process contributes to their own professional growth and development. The acquisition of teaching skills and pedagogical mastery, as well as successful integration into the school teaching community, largely depends on the individual teacher. A willingness to seek support from colleagues, overcome difficulties without losing motivation, recognize one’s own mistakes, and strive to correct them are key indicators of professional formation.

Moreover, the professional development of a teacher is closely linked to self-education, continuous self-improvement, and regular professional training. These aspects are integral components of professional qualities and ensure long-term effectiveness in teaching practice. A teacher must also have a strong command of the disciplines of psychology, pedagogy, and defectology, particularly in relation to the development and upbringing of students. In practical educational activities, it is essential to conduct various research and experimental tasks together with students. Such experiences contribute to the enhancement of the teacher’s pedagogical mastery while simultaneously fostering the development of students’ knowledge and practical skills. Finally, in the implementation of any educational activity, a teacher’s mastery and professional experience play a decisive role in achieving positive outcomes. A review of pedagogical literature shows that the concept of “mastery” has been interpreted in various ways, emphasizing its multifaceted and complex nature within the teaching profession.

Discussion

Mastery can be defined as the progressive development of one’s abilities and experience within a particular activity, ultimately leading to becoming a highly skilled professional in one’s field. In the context of teaching, pedagogical mastery is closely linked to the teacher’s personal and professional growth. If a teacher does not continuously engage in self-improvement, seek innovation, and strive for development, they risk falling behind the demands of modern education.

Therefore, it is essential for teachers to critically evaluate their own professional activity and to approach their work with a strong sense of responsibility and dedication.

The development of pedagogical mastery is supported by several key factors:

1. The implementation of a mentor–mentee (master–apprentice) tradition among teachers within educational institutions;
2. The positive influence of experienced and highly qualified teachers on their colleagues;
3. The organization of lesson observations and open classes, as well as receiving professional guidance from experienced educators, fostering collaboration, cohesion, and mutual support within the teaching community;
4. The elimination of negative traits such as excessive self-centeredness among some educators, thereby contributing to the enhancement of teachers' personal and moral qualities.

In this regard, within the framework of inclusive education, the social adaptation of graduates can be effectively enhanced by increasing their motivation for learning and fostering their interests. Motivation serves as a crucial factor in encouraging active participation and engagement in the educational process. A motive is understood as an internal and relatively stable factor that drives human behavior and initiates action. Motivation, in turn, is a dynamic process of psychological and physiological regulation of behavior, representing a system of motives that includes initiative, direction, organization, and support.

According to Sergei Rubinstein, the psychological essence of motivation can be described as a form of determination generated through the psyche. A motive represents a subjective reflection that directly connects the individual's cognitive processes with the external world. From this perspective, an individual maintains an active relationship with reality through their motives. As a driving force of behavior, motives occupy a central place in the structure of personality. The structural components of motives include the individual's orientation, emotional experiences, activities, and cognitive processes.

Based on the findings of this study, it is appropriate to propose the following recommendations: the systematic development of teachers' professional competence in inclusive education; the improvement of individualized educational programs for students with disabilities; the effective use of interactive methods that enhance motivation in the learning process; and the strengthening of psychological and pedagogical support systems.

Conclusion

The effectiveness of the educational process largely depends on the teacher's professional competence, pedagogical mastery, and continuous self-development. In the context of inclusive education, these requirements become even more demanding, requiring teachers to adopt an individualized approach, demonstrate psychological sensitivity, and effectively organize corrective-pedagogical activities. Motivation plays a crucial role in students' social adaptation and personal development, as it stimulates their desire for learning and active participation in the educational process. Therefore, the implementation of modern pedagogical approaches, the use of effective teaching methods, and the creation of a positive and supportive learning environment should be considered key priorities in the educational system.

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FORMS OF PHYSICAL EDUCATION AND SPORTS ACTIVITIES IN EDUCATIONAL INSTITUTIONS

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Abstract. *This article analyzes the main forms of organizing physical education and sports activities in educational institutions. The author highlights the role of physical education lessons and extracurricular activities in the comprehensive development of the younger generation. The significance of physical exercises in strengthening learners' health and increasing their level of physical activity is also substantiated.*

Keywords: *education, physical qualities, physical education, training sessions, sport, students, lesson.*

Introduction

Physical education and sports activities occupy one of the leading positions in the comprehensive development of the younger generation — intellectually, morally, and physically. Physical training plays a particularly significant role in fostering spiritually resilient and physically strong students [1]. In educational institutions, the development of physical education, health-improving programs, and mass sports activities is becoming an essential requirement of the time. It contributes to increasing students' interest in various sports and strengthens their knowledge, skills, and competencies.

The primary means of physical education in educational institutions is physical exercise. Physical exercises help address tasks related to the formation of motor skills and abilities among students [3]. Engagement in physical exercises implies specific forms of organization of training sessions and methods of structuring the educational process. Under lesson conditions, effective interaction is established between the teacher-coach and students in each form of activity.

The effective implementation of physical education objectives requires cooperation among educational institutions, teaching staff, extracurricular organizations, and parents. Such collaboration ensures broader public involvement in physical education and sports activities. Regardless of its form, each training session solves both general and specific tasks. According to the management structure, physical education activities are divided into two main forms:

Lesson-Based Form

This form is conducted by a teacher (coach) with a permanent group of students.

1. Physical education lessons are taught as a compulsory subject in accordance with state educational standards.
2. Sports training sessions are conducted by coaches to improve students' skills in their chosen sport.

Depending on the characteristics of instruction and management methods, activities are implemented in lesson-based and extracurricular forms. In the theory and practice of physical education within educational institutions, all forms of training are divided into two groups:

- The educational process carried out during lessons;

- Extracurricular activities that exert a comprehensive influence on the upbringing process.

Physical education lessons represent the primary form of physical training in the educational process [4]. The subject is included in the curriculum, and its content is defined by state educational standards. The main objective is to ensure the comprehensive development of students and prepare them for life, work, and national service. Compared to other forms of training, physical education lessons have several advantages:

- They are compulsory and systematically organized for all students;
- They are based on scientifically grounded state educational standards;
- They take into account students' age, gender, and individual characteristics under pedagogical supervision;
- They aim at educating a well-rounded generation regardless of physical ability, sports results, or medical grouping;
- They are directed toward improving physical preparedness and overall health.

The content of physical education lessons is multifaceted. It includes a structured set of exercises, student activities, and the teacher's pedagogical work, all reflected in measurable outcomes.

The structure and organization of lessons, as well as the objectives of their individual components, correspond to generally accepted pedagogical principles. However, the means of achieving these objectives may vary. When preparing lessons, teachers primarily consider students' physical condition and level of preparedness while defining key objectives and overall goals. To a certain extent, the lesson determines the content of other forms of physical education. Therefore, it remains the principal form of physical training for students. The educational process represents the integrated combination and organization of educational tools, methods, and tasks within a unified structure. Achieving high efficiency in each lesson requires a deep understanding of the theory and methodology of instruction.

Both lesson-based and extracurricular forms are further subdivided depending on location, duration, participant composition, content, and other factors. *Objectives of Physical Education and Health-Promoting Activities.* During the implementation of physical education and health-related activities, the following tasks are addressed:

- Increasing students' motor activity throughout the school day and teaching them to organize their daily routine properly;
- Maintaining optimal working capacity in academic activities, forming movement culture, and strengthening health;
- Promoting students' motor preparedness and physical development;
- Developing skills for independent engagement in physical exercises.

Extracurricular Form. Extracurricular activities are conducted either under specialist supervision or independently by students. Their purposes include active recreation, health restoration and strengthening, improvement and maintenance of work capacity, development of physical qualities, and enhancement of motor skills and abilities. Knowledge and skills acquired during lessons are reinforced and improved through extracurricular activities. These activities cultivate students' habit of regular engagement in physical education and integrate it into their daily lifestyle. While all forms share a common general goal, each also addresses specific objectives.

Extracurricular activities are organized on a voluntary basis. Their organization and content are determined according to school conditions and students' interests [5]. Students are given the opportunity to choose sports according to their preferences. Activities are conducted within the framework of school physical culture communities and are supervised by school administration and physical education teachers.

Extracurricular activities include:

- Sports clubs by discipline;
- General physical fitness groups;
- Rhythmic and athletic gymnastics groups;
- Mass sports competitions;
- Tourist excursions;
- Physical education and sports festivals;
- Olympic Days;
- Health Days.

These activities significantly strengthen students' health and increase their level of motor activity.

Modern Educational Reforms and Pedagogical Principles

Current reforms in the education system assign physical education teachers not only the responsibility of teaching exercises but also the task of forming a culture of a healthy lifestyle among students. The effective organization of lesson-based physical education requires adherence to the following scientific and pedagogical principles:

1. Individualization of Physical Load

Since students differ in health conditions and physical fitness levels, physical loads must be carefully regulated. It is necessary to fully utilize the system of medical group classification (main, preparatory, special).

2. Application of Interactive Methods

Elements of sports games, competitive activities, and game-based teaching methods should be incorporated into traditional exercise complexes. This is especially effective in fostering intrinsic motivation among primary and middle school students.

3. Integration of Digital Technologies

The use of modern smart technologies (such as heart rate monitors, pedometers, and mobile applications) enables students to observe and analyze their results in real time.

Problems and Solutions in Organizing Extracurricular Activities

Analysis shows that extracurricular sports clubs often focus primarily on talented student-athletes. However, the main objective should be to involve students with low interest in sports into mass physical activity.

To achieve this, it is recommended to:

- Regularly organize internal institutional championships (e.g., Rector's Cup competitions);
- Increase family-oriented sports events such as "Dad, Mom, and Me — A Sports Family";
- Promote non-traditional sports (table tennis, chess, badminton) based on students' interests.

Moreover, the effectiveness of physical education and sports activities directly depends on the material and technical base. Equipping sports halls with modern facilities and ensuring compliance with hygienic standards can increase training efficiency by at least 30–40%.

Conclusion and Recommendations

1. Systematic Approach: Physical education activities in educational institutions should not be limited solely to compulsory lesson hours. Instead, they should be integrally connected with mass sports events and sports club activities within the framework of the “Five Important Initiatives” program [3].
2. Digitalization and Monitoring: In accordance with Resolution No. PQ-5148 of the President of the Republic of Uzbekistan, modern information technologies should be introduced into the assessment of students’ physical fitness levels. It is essential to implement electronic monitoring systems to track the dynamics of each student’s physical development [2].
3. Efficient Use of Infrastructure: It is advisable to transform school and higher education sports facilities into continuously operating community sports centers during extracurricular hours, making them accessible to local youth and students [1].
4. Methodological Renewal: The organization of physical education lessons requires abandoning outdated instructional models and incorporating national and movement-based games, as well as modern fitness elements, to enhance the effectiveness of training sessions.

In conclusion, the comprehensive physical development of students, improvement of their sports mastery, and further enhancement of teachers’ and coaches’ professional activities, along with the effective utilization of various forms of physical education and sports activities in educational institutions, will significantly improve the overall quality of physical education. Directing all forms of physical training toward a unified goal — the formation of a healthy and physically strong generation — will elevate the quality of education to a new level.

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INNOVATIVE MECHANISMS OF MEDIA CULTURE IN THE PATRIOTIC EDUCATION OF MILITARY PERSONNEL

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Abstract. *This article examines the issues of improving military-patriotic education through the development of media culture among military personnel in the context of a digital society. The informational and psychological impact of the media environment, as well as the risks of fake information and manipulative content, are analyzed. In addition, based on national and international experience, innovative mechanisms for developing media literacy and information-psychological immunity are proposed.*

Keywords*: military-patriotic education, media literacy, information-psychological security, media reflection, cyber-psychological threats, national ideology, information culture, media simulation, virtual reality (VR), public security.*

Introduction

In the era of globalization and digital transformation, the increasing influence of the media environment on the consciousness of military personnel has become an issue directly related to public security. As the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, emphasized, “A defender of the Motherland must be armed not only with weapons, but also with knowledge and awareness” [1]. From this perspective, the development of media culture in military-patriotic education is considered an innovative educational direction.

Media culture is the ability of an individual to analyze information, critically evaluate it, and use it in the interests of society. This concept was defined by UNESCO in its 2022 guide “Media and Information Literacy Curriculum for Teachers” [2]. For military personnel, media culture implies the ability to resist information and psychological attacks, distinguish fake news, and protect national interests [5].

Media Culture Indicator	Expression in the Military Sphere
Critical thinking	Not trusting fake news
Information analysis	Comparing information sources
Spiritual immunity	Resistance to destructive ideas
Media activity	Promoting national ideology and responsible behavior on social media

Traditional lectures are a one-way method of information delivery, in which the instructor speaks while the learner passively receives information. In this approach, opportunities for emotional engagement, experiential understanding, and active thinking among military personnel or learners are limited. In contrast, interactive media platforms and digital simulators:

- ensure active participation, as military personnel engage with media content, make decisions, and learn from their mistakes;
- simulate real-life situations, allowing patriotic feelings to be understood not only through words but also through experience;

- create a strong emotional impact, as visual and audio effects convey national ideas more effectively through psychological experience;
- develop personal responsibility and quick decision-making skills, which are essential in military service.

Therefore, military-patriotic education delivered through interactive and digital methods is more effective than traditional lectures, as it produces a deeper impact and fosters long-term motivation. For example:

- Media simulation — decision-making trainers based on event scenarios;
- Virtual Reality (VR) — presenting historical battles and the lives of national heroes in VR format;
- Gamification — teaching national ideas and symbolic elements through media-based games;
- Case video analysis — understanding information manipulation by analyzing events on social media [3, 5].

Today, military personnel face not only physical threats but also information-psychological threats. Fake news, destructive content, false propaganda, and cyber manipulation can influence their consciousness, psyche, and motivation.

For this reason, innovative mechanisms are recommended, as they:

- develop the ability to critically analyze information;
- strengthen psychological resilience and information immunity;
- help identify and neutralize risks in the digital environment in advance;
- foster a culture of information security within military communities.

Through these mechanisms, military personnel develop not only as individuals who are protected, but also as active participants on the information front—patriotic and conscious individuals. In this regard, the following approaches are recommended as more effective in the current context:

1. MediaGuard trainings – understanding cyber-psychological threats and methods of manipulation.
2. OODA cycle-based analysis – adapting the *Observe, Orient, Decide, Act* model to media processes (in accordance with NATO models [3]).
3. Media reflection journal – a daily practice of information analysis and self-assessment conducted by military personnel.
4. Information-psychological immunity index – a diagnostic system for assessing an individual's resistance to media influence.

Foreign countries, particularly the USA, South Korea, Germany, Türkiye, and NATO member states, have introduced digital education and media culture as key elements in protecting military personnel from information-psychological threats and fostering patriotism.

Studying these experiences:

- enables the analysis of innovative approaches and their strengths and weaknesses;
- provides a scientific basis for adapting advanced international practices to the national context;
- serves as inspiration and methodological support for developing new trainings, simulations, and media platforms within the national military education system.

For example, in the U.S. Army, the "Media Literacy for Defense" program trains military personnel to detect fake information, while in South Korea, "Cyber Awareness Training" equips

them to respond to digital threats. Adapting such models within the national system can significantly enhance information-psychological resilience.

National experience does not mean blindly copying foreign models; rather, it involves harmonizing them with national values, mentality, and state security strategies. Through comparative analysis, it becomes possible to:

- identify existing shortcomings in the national system;
- integrate effective foreign practices with national foundations;
- establish a scientific basis for developing unique methods aligned with national ideology and spiritual values.

Thus, by studying international experience and comparing it with national approaches, it is possible to implement innovative, scientifically grounded, and nationally relevant pedagogical models in the education and training of military personnel.

Country	Model Name	Brief Description
USA	Media Literacy for Defense	Information-psychological resilience courses are organized within the military
South Korea	Cyber Awareness Training	VR simulations to counter internet-based information manipulation
Germany	Digital Citizenship Program	Development of digital responsibility and information ethics among military personnel

The effectiveness of introducing innovative mechanisms (media simulations, VR-based learning, gamification, interactive media platforms, etc.) into the process of military-patriotic education lies in the following:

1. Enhancing personal experience. Military personnel learn not only theoretical knowledge but also decision-making in real-life-like situations. This strengthens patriotic feelings through emotional experience.
2. Transforming learners into active participants. Unlike the traditional teacher-centered model, personnel become active subjects of the learning process. This fosters active thinking, responsibility, and self-awareness.
3. Developing information-psychological immunity. Through simulation and media analysis tools, individuals learn to recognize misinformation, detect manipulation, and respond to threats with psychological readiness.
4. Improving digital competence. Military personnel acquire skills in working with modern media technologies, filtering information, and adhering to information security principles.
5. Increasing psychological motivation. Interactive methods enhance emotional engagement, making military personnel feel active, valuable, and responsible.

Innovative educational mechanisms are based on the following scientific and regulatory foundations:

1. The speeches of President Sh. Mirziyoyev on education and patriotic upbringing, emphasizing that “every serviceman must be equipped with modern knowledge and media culture”;
2. UNESCO (2022) *Media and Information Literacy* program, which provides international standards for integrating media literacy and information culture into education [2];
3. NATO STRATCOM (2023) reports, which outline models for preparing military personnel with psychological resilience in the information environment;

4. Regulatory and legal documents of the National Guard system of the Republic of Uzbekistan aimed at harmonizing physical, spiritual, and intellectual training.

When these innovative mechanisms are implemented:

- patriotic feelings among military personnel are strengthened through experience;
- a culture of information security is formed;
- the educational process becomes an integrated, technology-driven, and highly effective system.

Currently, the following mechanisms have proven effective in practice:

1. Media literacy platform (Mediapedia.uz) – online courses, tests, and video lessons for military personnel;
2. Multimedia modules – interactive content such as *"My Motherland – My Pride"*;
3. Collaboration with mass media – producing programs and special reports that promote military-patriotic values;
4. AI-based analysis – algorithms using neural networks to detect media manipulation.

Based on the above analyses and theoretical conclusions, it becomes necessary to define a number of practical tasks for preparing military personnel in the fundamentals of media culture and information-psychological security. In the context of emerging threats, destructive ideas, and information manipulation in the digital environment, the modernization of the military education system is becoming an integral part of the national security strategy. Therefore, the following proposals are put forward:

1. Systematic training in media culture should be established as a key element of the national security system. This will enable military personnel to develop independent thinking and analytical skills within the information environment.
2. Strengthening information-psychological immunity will enhance patriotism and ensure ideological stability among military personnel. In this regard, the organization of specialized trainings, simulations, and media education courses is highly effective.
3. Integration of digital media tools into patriotic education should be supported at the level of state policy, ensuring a systematic approach to preparing both youth and military personnel against information threats.
4. The introduction of the subject "Media Culture and Cybersecurity" in military educational institutions is advisable. This discipline will not only improve information literacy but also strengthen national ideology and spiritual resilience.

In conclusion, in the context of the modern digital environment, strengthening the moral and ethical stability of military personnel, fostering a responsible attitude toward information, and reinforcing patriotic values are strategic priorities of the national security system. To effectively counter threats and destructive influences in the information space, military personnel must be equipped not only physically but also intellectually, in media competence, and in information-psychological preparedness.

By integrating media culture into the system of military training, personnel develop the ability to recognize fake information, understand manipulation techniques, and protect national interests. This plays a crucial role not only at the individual level but also in ensuring information-psychological stability and collective discipline within military units. International experience demonstrates that in advanced military systems, training in media literacy and information security is an integral part of military education. By adapting these models to national ideology and spiritual

values within the system of the National Guard of Uzbekistan and military educational institutions, it is possible to develop a distinct national model of media culture.

Interactive media platforms, digital simulators, training programs for information-psychological immunity, and case analysis technologies serve as innovative pedagogical mechanisms in modern military-patriotic education. As a result, military personnel become not only defenders of the Motherland but also promoters of national values and critical thinking in the information space. Thus, the deep integration of media culture into military education, the development of information competencies, and the upbringing of personnel based on national values form a modern scientific and pedagogical foundation for ensuring national security through the human factor.

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A METHODOLOGICAL MODEL FOR IMPROVING THE SOCIO-HISTORICAL COMPETENCIES OF ENGINEERING STUDENTS BASED ON DIGITAL TECHNOLOGIES

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Abstract. *This article develops a methodological model aimed at improving the socio-historical competencies of engineering students through the use of digital technologies and scientifically explains its theoretical and methodological foundations. Within the framework of the study, the role and effectiveness of digital educational platforms (LMS, MOOC), interactive and project-based teaching methods, as well as approaches based on interdisciplinary integration in the educational process were systematically analyzed. The methodological model is aimed at the integrated development of socio-historical knowledge, values, and practical skills in engineering education, and it serves to ensure harmony among educational content, digital technologies, and pedagogical methods. The research findings indicate that an educational environment organized on the basis of digital technologies demonstrates high effectiveness in developing students' social responsibility, historical thinking, critical thinking, and professional consciousness [1]. The results of this article have scientific and practical significance for modernizing engineering education, introducing digital pedagogical technologies into educational practice, and improving methodological approaches aimed at forming socio-historical competencies.*

Keywords: *digital technologies, methodological model, engineering education, socio-historical competence, interdisciplinary integration.*

Introduction

The modern education system is undergoing a process of digital transformation on a global scale. The rapid development of information and communication technologies and their wide implementation in the educational process necessitate a fundamental renewal of teaching methods, forms of education, and learning content [2]. Digital technologies expand opportunities for individualizing the educational process, increasing interactivity, and mastering knowledge in a practical context, thereby creating a favorable pedagogical environment for the formation of modern competencies.

Particularly in engineering education, the use of digital tools is not limited to acquiring technical knowledge and skills; it also opens new opportunities for developing students' socio-historical competencies. Through virtual learning environments, digital historical sources, interactive simulations, and project-based learning technologies, students gain opportunities to understand more deeply the social and historical aspects of engineering activity. This is of great importance in shaping their conscious and responsible approach to professional activity.

Today, engineering specialists play an important role in the development of society and directly influence not only technological progress but also social stability and cultural development. Therefore, the professional activity of engineers must be harmonized with social responsibility, historical awareness, and civic position [3]. A methodological model developed on the basis of digital technologies serves to systematically, consistently, and effectively develop socio-historical competencies in engineering education and makes it possible to train students not only as technically competent specialists but also as socially responsible professionals.

Methodology

In the course of the study, a комплекс use was made of the methods of systemic approach, pedagogical modeling, comparative-pedagogical analysis, and analysis of scientific literature. The systemic approach made it possible to study the process of developing socio-historical competencies in engineering education as an integral pedagogical system, while comparative-pedagogical analysis served to compare foreign and national educational experiences.

The competency-based approach was chosen as the methodological foundation of the study, within which socio-historical competencies were interpreted as an integrated set of knowledge, skills, values, and attitudes [4]. This approach is aimed at ensuring the development not only of students' theoretical knowledge but also of their social responsibility and historical thinking.

The methodological model for improving socio-historical competencies through digital technologies was developed as consisting of target, content-related, technological, and assessment-resultative components [5]. This model envisages the consistent and effective formation of socio-historical competencies through the systematic use of digital tools in the educational process.

Results

As a result of the conducted research, a comprehensive methodological model aimed at improving the socio-historical competencies of engineering students on the basis of digital technologies was developed. This model presupposes the systematic use of the digital environment in the educational process and includes the management of learning materials through LMS systems, the use of international educational resources through MOOC platforms, the analysis of historical processes on the basis of virtual historical resources, and the enhancement of student activity through digital project work and online discussion platforms [6].

During the implementation of the model in practice, students participated as active subjects of the educational process and gained the opportunity to independently analyze historical events and social issues related to engineering activity on the basis of digital sources. In particular, through the use of virtual documents, interactive maps, and multimedia materials, the influence of historical processes on the development of engineering was understood more deeply. This had a positive impact on the formation of students' historical thinking and social responsibility.

In addition, participation in collaborative digital projects developed students' skills of cooperation, communication, and critical thinking. Through projects and discussions aimed at evaluating the social consequences of engineering activity, students acquired the skills to make informed professional decisions and assess their impact on the development of society [7]. The research findings show that the methodological model developed on the basis of digital technologies makes it possible to effectively and sustainably develop socio-historical competencies among engineering students.

Discussion

The obtained research results confirm that the methodological model developed on the basis of digital technologies has high effectiveness in developing socio-historical competencies in engineering education [8]. The harmonious application of interdisciplinary integration and digital educational tools transforms students from passive participants in the learning process into active subjects and serves the conscious assimilation of knowledge not only in a theoretical sense but also in social and historical contexts. This creates opportunities to strengthen students' critical thinking, their ability to evaluate historical events, and their understanding of the impact of engineering activity on the development of society.

Furthermore, projects and discussions organized in a digital environment positively influence the development of students' competencies in independent inquiry, teamwork, and drawing evidence-based conclusions. Such an approach contributes to the humanization of engineering education and emerges as an important pedagogical factor in shaping the professional ethics and social responsibility of future specialists.

However, there are also a number of limiting factors in the process of introducing the methodological model into practice. In particular, the level of teachers' digital competence, the technical infrastructure of educational institutions, and the quality of digital educational resources directly affect the effectiveness of the model. If these factors are not sufficiently ensured, it becomes difficult to fully use the pedagogical potential of digital technologies. Therefore, in implementing the methodological model, special attention should be paid to retraining teachers, strengthening digital infrastructure, and creating high-quality electronic resources [9].

Taking these factors into account, it is important to adapt the methodological model developed on the basis of digital technologies to the pedagogical traditions, historical-cultural characteristics, and existing opportunities of the national education system. Such adaptation serves to ensure the sustainability and long-term effectiveness of the model.

Conclusion

In conclusion, it is evident that the methodological model aimed at improving the socio-historical competencies of engineering students on the basis of digital technologies has important pedagogical significance in the modernization and humanization of engineering education. Through the systematic and purposeful use of digital educational tools, this model makes it possible to consistently develop not only students' technical knowledge but also their social responsibility, historical thinking, critical thinking, and professional consciousness [10].

The research results show that the combination of digital technologies, interdisciplinary integration, and interactive teaching methods enriches the content of engineering education and contributes to shaping students as active subjects of the learning process. Such an approach creates a foundation for future engineering specialists to make informed professional decisions, evaluate the social and historical consequences of engineering activity, and understand their responsibility to society.

The findings of this article serve as a scientific and practical basis for the introduction of digital pedagogical technologies into engineering education, the improvement of curricula on the basis of a competency-based approach, and the strengthening of the role of socio-historical disciplines in the educational process. At the same time, the conclusions of the study create a theoretical foundation for the development of empirical research and methodological frameworks aimed at advancing engineering education on the basis of digital technologies.

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METHODOLOGICAL OPPORTUNITIES FOR DEVELOPING A SENSE OF NATIONAL IDENTITY IN ADOLESCENTS THROUGH HISTORICAL KNOWLEDGE

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Abstract. *This article discusses such structural models, consisting of the main structural elements of historical thinking, which are the basis for the development of a sense of self-awareness in students by providing them with historical knowledge, the dynamics of its development, features of historical thinking, the course of historical processes, its role in the development of students' point of view and imagination.*

Keywords*: national identity, value, education, historical thinking, historical knowledge, legends, communication, modeling.*

Introduction

The category of historical thinking serves as a key mechanism in the methodology of developing a sense of national identity among adolescent students through historical knowledge. In developed countries around the world, a number of international studies aimed at fostering students' awareness of national identity through historical knowledge are carried out on the basis of such approaches as historical thinking, historical empathy, civic education and national-civic identity, multicultural and intercultural education, as well as heritage-based education.

In a study conducted by Teresa Maresh, the differences between knowing history and historical thinking were examined. The author, relying on the views of Polish scholars such as O.M. Medushevskaya, B. Miskevich, Jerzy Topolski, S. Kossyalkovsky, and G. Labuda, analyzes the concept of "thinking" in this context. This article discusses how the presentation of historical knowledge to students can contribute to the development of their sense of identity, focusing on historical thinking, its developmental dynamics, its defining features, the nature of historical processes, and its role in shaping students' perspectives and imagination.

According to the author, historical thinking and historical knowledge are interrelated in a reciprocal manner. That is, historical thinking is formed on the basis of historical knowledge, while historical knowledge is acquired through the presence of historical thinking. Expressed in terms of mathematical logic, historical knowledge manifests itself on the basis of numerous instances of historical thinking. Accordingly, the concept of "historical thinking" is broader than the notion of "historical knowledge."

In scientific and methodological literature, based on the ideas of I. Gittis and I. Lerner, a structural model of historical thinking—one that remains relevant to this day—has been proposed. This model includes the following core components: the application of historical facts and events; the understanding that historical events and phenomena are interconnected and grounded in a certain chronology; the recognition of cause-and-effect relationships that reveal similarities and differences; the comprehension of the regularity of these relationships; the presence of the idea of

staged or phased development; and the systematization of multiple historical facts within the framework of a single historical event.

In the glossary of historical concepts titled “Historical Thinking,” the key concept is defined as follows: a set of mental processes underlying cognitive activity associated with the modeling of historical reality in the course of socio-cultural communication, based on language and information about it.

In their research, D.I. Ulbutov and N.S. Krot attempt to determine the levels of historical thinking formed among senior students of general secondary schools. For this purpose, the authors develop criteria for assessing the degree of its formation based on the following indicators of historical thinking: understanding the progressive development of historical processes through mastery of the concept of “historical time”; correlating historical phenomena with contemporary historical events; bringing diverse historical objects, which do not share the same status, to a common basis by generalizing their developmental processes; increasing the significance of characteristic features (stereotypes) that exist or previously existed when interpreting historical facts (i.e., generalizing historical representations under common labels); understanding dialogue (interconnectedness) between different cultures; comprehending the dynamic nature of historical phenomena (in general, the dialectic of individuality); verifying the reliability of historical facts through reference to primary sources; relying on rationality (their validity and correctness) and pragmatism (the idea of describing historical realities according to their external connections and consistency) in accepting historical facts; substantiating the development of historical processes based on both emotional and logical reasoning; recognizing the dynamic interrelation between subjective and objective aspects of historical phenomena; and applying the dialectics of comparing contradictory events in order to identify the logical proportionality between historical processes.

According to the Italian author’s approach, myths are neither falsehoods nor merely invented ideas; rather, they serve as a key to understanding not the surrounding nature itself, but the forms that express the lives of ancient people and the functions of their consciousness. Myths represent a specific organizational form of time and space through which it becomes possible to obtain knowledge about early human society and its representatives, as they constitute one of the primary sources of such information.

Ideas that we now consider absurd merely reflect our lack of understanding of the past. If we were able to comprehend the unique poetic lyricism of the creators of these myths, their seeming irrationality would disappear. Myths, in fact, can provide evidence about truth and reality that is no less grounded and reliable than that offered by modern scientific disciplines.

In a study conducted by M.A. Kissel, it is shown that for Giambattista Vico, myths are products of archaic (ancient) consciousness that convey information about the distant past of human history. The author cites Vico’s following idea on this matter: “Early humans were like the children of the human race; therefore, they were not capable of representing objects and phenomena in the way modern intellectuals do. Consequently, they were naturally compelled to express them through certain images or in forms close to idealized portraits—poetically, in a fantastic or universal manner.”

Indeed, myths constitute one of the essential foundations that significantly contribute to the formation of historical knowledge. Therefore, they contain, to a certain extent, elements of historical truth. The creator of myths is the people themselves; thus, they are regarded as a form of collective creative expression. As a unique synthesis of ideas, beliefs, and perceptions belonging to the masses, myths embody certain truths related to the historical past of a particular ethnic group,

nation, or people. This, in turn, suggests that in general secondary education, integrating history teaching with national literature can be highly beneficial, enabling students to use myths as a distinctive type of primary historical source. At the same time, the study of myths helps develop students' professional competencies, such as analyzing the essence of historical events and phenomena, examining the social, economic, and cultural factors characteristic of a particular period, searching for additional historical evidence, and providing well-grounded interpretations. The issue of historical thinking and its development in an individual is one of the most ancient problems and has been studied since the earliest periods when the category of thinking itself began to be explored. For instance, the ancient Greek philosopher Socrates paid particular attention to the study of historical memory in his philosophy. According to the philosopher, historical memory enables an individual to achieve self-awareness.

"Only a person who knows oneself clearly understands what is beneficial and what one is capable of. By engaging in activities within one's abilities, a person satisfies personal needs and attains well-being, avoiding errors and misfortunes. As a result, such a person is able to value others and make use of them for good purposes, ultimately protecting oneself from adversity."

In the monograph *"Theoretical Foundations of the Philosophy of History"* by N.J. Jurayev, it is emphasized that knowledge of history is a decisive factor in the formation of national identity. Indeed, "self-awareness, first and foremost, begins with the study of the past and the need to know history. In fact, every person who seeks to understand oneself strives to learn about one's origins—where one was born, who one's ancestors were, what occupations they pursued, and how they lived. Such a person lives with pride in their virtues and heritage. Historical thinking and historical memory are formed in this very way."

The ideas advanced in the research of Y.V. Slominskaya complement the views of Jo'rayev and further confirm the increasing importance of historical knowledge in the context of today's complex geopolitical processes. "In the conditions of the complex geopolitical processes occurring in the world, the study of historical knowledge is extremely important. It makes it possible to form a coherent system of economic, political, and philosophical views, and teaches the younger generation to think independently and broadly, avoiding one-sided judgments and conclusions that lack objectivity. Historical knowledge enables us to look into the future through the prism of the past."

In his research, G.B. Khojametov focuses on the problem of using ICT to enhance the effectiveness of teaching history. According to the author, in modern conditions, it is possible to achieve greater efficiency in teaching history through the creation of a virtual museum using ICT tools. In this regard, the following stages for developing a virtual museum are outlined:

1. Introducing students to the functional capabilities of Visme and Netlify, which allow them to create and present a virtual museum, and demonstrating the importance of using these tools for didactic purposes.
2. Collecting photographic materials on the topic "Ancient States in the Territory of Central Asia."
3. Selecting, systematizing, and categorizing the collected materials.
4. Forming sections of the virtual museum based on topics assigned to small groups and providing explanatory descriptions for each section.
5. Presenting the theoretical descriptions, photographs, and texts in a visual format using the Visme and Netlify platforms.

Indeed, the development of modern education cannot be imagined without the influence of ICT. Today, in teaching history, the use of contemporary teaching tools such as virtual museums, virtual excursions, virtual galleries, interactive presentations, e-posters, and online dictionaries helps enhance teaching effectiveness. In the research conducted by Kh.K. Boymirzayev, the object of study was the process of improving history teaching methodology within an innovative educational environment. The study identified the effectiveness of graphic organizers such as "Thesis Organizer," "Cognitive Map," and "Morphological Box" in enhancing the teaching of history. Furthermore, it has been established that in teaching the subject *"History of Uzbekistan"*, computer technologies such as PowerPoint, Hot Potatoes, as well as the Visme and Netlify platforms, can be used to create interactive posters that effectively organize the learning process. These tools facilitate thorough mastery of learning materials by students, allow monitoring of their educational activities, and serve to assess the level of knowledge and skills acquired.

Conclusion. In developing a sense of national identity among adolescent students through historical knowledge, international studies in developed countries, along with research conducted to reform the national education system, emphasize approaches based on historical thinking, historical empathy, civic education and national-civic identity, and heritage-based learning. These studies highlight that the integration of such approaches in teaching serves as a foundation for scientific research in this field, taking into account modern methodological possibilities and contributing to the development of new contemporary educational technologies.

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THE USE OF PROJECT-BASED ACTIVITIES IN MECHANICS LABORATORY LESSONS

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Abstract. *This article describes the theoretical and practical foundations of using project-based activities in organizing laboratory classes in mechanics at higher education institutions. The importance of applying project-based learning technologies alongside traditional laboratory sessions in developing the professional competencies of future physics teachers in modern educational conditions is substantiated. In addition, the pedagogical opportunities, advantages, and practical significance of implementing project-based activities in mechanics' laboratories are revealed.*

Keywords: *mechanics, laboratory classes, project-based activity, project-based learning, physical experiment, professional competence, future physics teacher, innovative educational technologies, digital competence.*

Introduction

The large-scale reforms currently being implemented in the education system of Uzbekistan necessitate the further enhancement of the quality of training for future pedagogical personnel in higher education institutions. Particularly, in the teaching of natural and exact sciences, including physics, the introduction of modern pedagogical approaches, innovative technologies, and practice-oriented forms of education is becoming a priority. From this perspective, improving the organization of laboratory classes in mechanics and directing them toward students' independent, creative, and research-based activities is of significant importance.

Project-based activity ensures the practical orientation of education, fosters interdisciplinary integration among students, and develops their scientific research abilities. The use of project-based methods in teaching physics enables students to apply their theoretical knowledge to real-life situations and also guides them toward innovative thinking and problem-solving. During the process of project-based activity, students acquire skills such as teamwork, a sense of responsibility, and initiative. At a time when the practical significance of physics is steadily increasing under the conditions of scientific and technological progress, preparing students for project-based activity is an important factor in the development of their professional competencies. From this perspective, there is a need to conduct scientific research in this area and to develop a methodological system that meets the modern requirements of physics education. Therefore, the issue of preparing students for project-based activity in the process of teaching physics is of both theoretical and practical importance.

Mechanics is one of the fundamental branches of the physics course, forming essential physical concepts such as motion, force, energy, momentum, equilibrium, and oscillation. Laboratory classes in mechanics play a vital role in reinforcing theoretical knowledge through experimentation, understanding the practical manifestation of physical laws and phenomena, and developing experimental skills. However, traditional laboratory sessions are often dominated by working based on ready-made instructions, which limits the opportunities to fully develop

students' creativity, independent decision-making, and research capabilities. Consequently, the utilization of project-based activities in mechanics laboratory classes is emerging as a significant pedagogical challenge.

Project-based learning (PBL) is considered an effective pedagogical technology that directs students toward understanding problem situations, analyzing them, gathering information, developing solutions, and creating practical results. In this approach, the student is at the center of the educational process, acting not as a passive recipient of ready-made knowledge, but as an active subject who conducts independent research, performs experiments, and evaluates results. Utilizing project-based activities in mechanics laboratory classes does not limit students to merely performing pre-designed laboratory tasks; instead, it engages them in comprehending the experimental content, selecting equipment, justifying measurement methods, determining errors, and analyzing results. This, in turn, further strengthens the professional preparation of future physics teachers.

Laboratory works in mechanics typically cover the following topics: studying the motion of objects launched horizontally and at an angle to the horizon, investigating the conservation of energy and momentum in elastic collisions, determining the moment of inertia of a wheel (disk), verifying the laws of rotational motion of rigid bodies using Oberbeck's pendulum, determining the moment of inertia of bodies through oscillations, calculating the acceleration of free fall using physical and mathematical pendulums, studying the motion of Maxwell’s pendulum, locating the center of gravity of an apparatus, determining the moment of inertia of a rigid body using a gyroscopic pendulum, finding the elastic modulus through bending, stretching, and torsion, investigating mechanical resonance, studying the temperature dependence of the speed of sound in air, exploring gyroscopic motion, and determining the moment of inertia of a sliding object on an inclined plane, among others. Conducting experiments on these topics requires students to perform precise measurements, calculations, construct graphs, identify patterns, and derive theoretical conclusions.

In traditional education, laboratory work is conducted based on a pre-defined algorithm: the objective is set, instruments are provided, the procedure is outlined, and the student is merely required to record the results. While this method is effective to a certain extent, it fails to fully develop a student's competencies in exploration, experimental design, and independent problem-solving. In laboratory classes organized through project-based activities, students perform practical tasks aimed at solving specific physical problems. For instance, topics such as “determining the coefficient of friction on various surfaces”, ”calculating the acceleration of free fall using a simple pendulum”, “investigating the dependence of the period on factors in spring oscillations” and “experimentally verifying the law of conservation of mechanical energy” can be structured in the form of projects.

In this process, students:

Identify the problem;

Define the research objective;

Formulate a hypothesis;

Select the necessary equipment and tools;

Develop an experimental plan;

Conduct measurement activities;

Represent the results in tables, graphs, and charts;

Analyze errors;

Formulate final conclusions and recommendations.

In this framework, the teacher participates not as the primary information provider, but as a consultant, facilitator, and coordinator of activities.

Let us examine the competencies formed through project-based activities. The use of project activities in mechanics laboratory classes fosters a range of essential professional and personal competencies in students:

Firstly, experimental competence is developed. The student acquires skills in planning experiments, correctly utilizing instruments, performing measurements, and processing the obtained data.

Secondly, research competence is formed. The student perceives the problem, proposes a hypothesis, verifies it through experimentation, and reaches a conclusion.

Thirdly, methodological competence is enhanced. This is because the future teacher learns how to organize laboratory work, how to guide students, and how to effectively apply physical experiments within the educational process.

Fourthly, information-communication and digital competence are established. The use of virtual laboratories, digital measuring devices, sensors, simulators, and data processing software in modern laboratory processes increases the digital literacy of students.

Fifthly, communicative and social competencies are developed. Students' collaborative skills are strengthened through group work, task distribution, exchanging ideas, engaging in debates, and presenting results.

The use of project-based activities in mechanics laboratory classes offers several pedagogical advantages. First, it increases students' engagement in learning activities; the student transforms from a passive executor following ready-made instructions into an active participant solving problems. Second, it strengthens the integration of theory and practice; as the laws and concepts of mechanics are verified through experimentation, their essence is understood more deeply. Third, it fosters independent learning and a creative approach, teaching students to approach problems from different perspectives, seek non-traditional solutions, and evaluate their own performance. Fourth, it enables effective time management; in conditions where classroom hours are limited, certain project stages can be organized as independent study. Fifth, this approach enhances the practical preparation of future teachers for their career, as they master not only the physical content but also the technology of teaching laboratory sessions.

At the same time, there are certain challenges in implementing this approach. These include the shortage of laboratory equipment, low levels of digital tool provision, incomplete methodological support, time constraints, and the lack of readiness among some teachers to utilize innovative technologies. Furthermore, not all students are equally prepared for independent research. Therefore, it is advisable to implement project-based activities gradually, based on the principle of 'from simple to complex.

To ensure the effective use of project-based activities in mechanics laboratory classes, the following pedagogical conditions must be met:

1. Selecting laboratory topics according to modern requirements, dual education, and students’ preparation levels;
2. Gradually increasing the complexity of small projects performed during laboratory classes and independent study;
3. Ensuring an optimal balance between hands-on laboratory work and virtual laboratory tools;

4. Developing clear assessment criteria and reflection methods for student knowledge;
5. Harmonizing students' independent and group work activities;
6. Effectively utilizing digital technologies and modern information tools.

Methodological recommendations:

The following methodological recommendations can be proposed for the use of project-based activities in mechanics laboratory classes:

Beginning each laboratory session with a specific problem or practical question;

Providing students with relative autonomy in selecting experimental methods;

Training students to use digital tools for processing measurement results;

Implementing the defense of project results in the form of presentations, reports, posters, or electronic portfolios;

Making reflection an integral part of the laboratory session.

In conclusion, the utilization of project-based activities in mechanics laboratory classes is one of the key factors in enhancing the effectiveness of professional training for future physics teachers. This approach serves to form experimental, research, methodological, digital, and communicative competencies in students. Project-based activity creates significant opportunities for linking theoretical knowledge in mechanics with practical experience, developing students' independent thinking and creative approaches, and preparing them for their future pedagogical careers.

Therefore, enriching mechanics laboratory classes with project-based learning technologies, integrating hands-on experiments with virtual simulations, improving teaching and methodological support for this process, and developing assessment criteria are essential scientific and methodological tasks that must be addressed today. Introducing project-based activities into the process of teaching physics is one of the most effective ways to enrich the educational content, develop students’ professional competencies, and prepare them for modern scientific research. The methodological recommendations and practical experience developed in this area will undoubtedly contribute to improving the quality of physics education in higher education institutions.

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METHODOLOGY FOR DEVELOPING STUDENTS' CREATIVITY ORIENTED IN LEARNING RESEARCH AND DESIGN IN CLASSROOMS AND OUT-OF-CLASS ACTIVITIES BASED ON STEAM EDUCATION

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Abstract. *It is necessary to improve school programs based on STEAM education, revise curricula and subjects, bring them into line with international standards, improve the quality of textbooks and literature, improve standards in higher education based on foreign experience, organize innovative activities for teachers, cultivate creativity aimed at educational research and design in classes and extracurricular activities, determine the stages of its formation as follows, and create a basis for students to develop imagination skills for sustainable, high-quality, low-cost, and sustainable living in real life, taking advantage of the available opportunities.*
Keywords: *program, approach, imagination, opportunity, integration, innovation, approximation, research, project training, creativity, foreign experience.*

Introduction

STEAM education in our country: Decree of the President of the Republic of Uzbekistan dated September 5, 2018, PQ-5538 “On additional measures to improve the public education management system”, In accordance with Resolution No. PQ-4199 of February 20, 2019 "On Measures for the Organization of Presidential Schools", Presidential schools for talented youth have been opened in each region of our country. In the Address of the President to the Oliy Majlis at the beginning of 2020, a number of issues were considered: improving school programs based on foreign experience, revising curriculum and subjects, bringing them into line with international standards, improving the quality of textbooks and literature, improving standards in higher education based on foreign experience, revising educational areas and subjects taught, and halving the number of non-specialized subjects.

STEAM education content: The demands of today's world pose great challenges in global education, that is, in preparing a child for life in society. At the same time, first of all, it is necessary to form among modern students the image of professionals who actively work in accordance with rapidly changing, updated information. The acquisition, processing, and application of information are the cornerstones of the STEAM curriculum. The term STEM: first introduced into the school curriculum in the United States, it aims to develop students' competencies in science and technology. Later, this series was expanded and additional letters were added to the term. In particular, “R” was added - robotics and “STRAIN” - or “A” - art, and it was called STEAM. This is (S - science, T - technology, E - engineering, A - art, M - mathematics) - a modern approach that combines science, technology, art and mathematics.

Integration (from Latin integratio - restoration, completion, integer - whole). Current science curricula challenge students to master a large number of concepts, which act as discrete

elements of knowledge. This creates difficulties in forming a holistic picture of the world, hinders the organic perception of culture, and becomes one of the reasons for the school graduate's fragmented worldview. Integration is the process and result of establishing interdisciplinary and interdisciplinary connections, achieving the integrity of educational content through interaction between different educational programsIn an integrated lesson, the subject of analysis is multifaceted objects, information about their essence is contained in various sources of information. The participation of teachers of relevant subjects in the organization of integrated lessons solves the psychological problem, which allows children to easily assimilate a new block of information, helps to increase the level of the teacher's general and professional culture, and helps to develop value orientations of schoolchildren from the point of view of global education.

Integrated extracurricular activities (projects, excursions, intellectual games). Integration in primary education can be divided into internal and external integration. In addition, innovative knowledge in physics, chemistry, and biology is provided through integration. The word "innovation" comes from Latin and means to introduce something new.

Innovative activity is the creation of a new technological process or a new improved product using scientific research, development, experimental work, or other scientific and technical achievements. Its pragmatic feature is that it is carried out neither in the field of ideas nor in the field of action of an individual subject, but is considered truly innovative only when the experience of implementing this activity becomes available to everyone in people's lives. The true essence of innovative activity is the formation of a new technology, the result of which is an activity aimed at transforming an invention that emerged as an innovation into a project, and a project into technology. The teacher can organize innovative activities and foster creativity focused on educational research and design in classroom and extracurricular activities, defining the stages of its formation as follows:

The first stage is the exact copying of the finished methodological recommendations. The second stage is when some new devices (modifications) and methods are introduced into the existing system. The third stage is when the content, methods, and form of implementing the new idea are fully developed. The fourth stage - the teacher develops his own concept and methodology of teaching and upbringing. When preparing teachers for innovative activities, it is necessary to take into account the psychological climate in the team and the extent to which team members are aware of innovations in the global education market. STEAM educational technology is based on a design approach and is based on cognitive and artistic inquiry. Such studies are carried out in the field of scientific research, acquiring knowledge in the process of practical activities, and then re-applying it in practice, that is, building structures in games using elements of technical creativity. STEAM education directly connects students' development to the outside world. As is known, natural sciences, technologies that are directly related to the world around us, are constantly used in our daily lives, and engineering is seen in homes, roads, bridges and cars, in professions, our daily knowledge is more or less dependent on mathematics.

Research materials and methodology

Relevance of the topic: A STEAM education-based approach allows young people to systematically explore the world, logically observe the processes taking place around them, discover new, unique, and interesting things for themselves, and understand their interconnections. By anticipating new things, the student becomes interested in learning, identifies an interesting problem for himself, develops an algorithm for finding a solution, critically evaluates the result, and develops engineering aspects of thinking.

Goals and objectives of the lesson: The main premise of the STEAM approach is that practice is as important as theoretical knowledge. At the same time, students must use not only their minds, but also their hands in the learning process. The learning process in the classroom has lagged behind the rapidly changing world. The main feature of the STEAM approach is that students use their minds and hands to effectively master many subjects, to "master" knowledge on their own. Students conduct experiments in the classroom, create models, create their own music and films, create robots, that is, implement their own ideas and create products. Because STEAM gives students the opportunity to apply what they learn in an educational environment, they will be faced with real-life problems as they grow up, such as environmental pollution, climate change, etc. problems, they only need to rely on their knowledge of different fields of science and work together. Relying on knowledge in one subject is not enough. Accordingly, the STEAM approach is also a way of thinking.

STEAM focuses on developing students' practical skills, which strengthens their collaboration, creativity, and willpower. Such knowledge and skills are the main task of education, and the entire education system strives for this. Many countries, including the US, Singapore, Korea, Australia, China, the UK, and Israel, have government programs in STEAM education. New types of jobs, as well as new areas of specialization, emerge every day, which must make today's educators think: Are the knowledge and skills of the students they are teaching up to date? STEAM education is highly valued in many countries for the following reasons: In recent years, the world has experienced a shortage of IT specialists, programmers, engineers, high-tech manufacturing specialists, and other similar professions; In the future, there will be professions that are difficult to imagine now, all of which are related to natural sciences, technology, and high-tech manufacturing. In particular, the need for specialists in bio and nanotechnology will increase; future specialists need comprehensive training and knowledge in various fields of education: natural sciences, engineering, and technology.

Search results

STEAM technology, unlike education, allows for the transfer of knowledge in a balanced manner, rather than in isolation. The student develops non-standard thinking, computational and creative abilities, which will be very useful in his future career. ***The structure of the practical*** training includes the procedure for performing the training and the names of the necessary educational equipment for its conduct. The student observes, identifies, and analyzes natural phenomena based on the assigned task. A separate hour is allocated for the practical training lesson. Before organizing the project work, the teacher develops a system of project work assignments. Students in the class, individually or in groups, independently collect information from various sources (textbook, Internet system) on the topic for a specified period of time, form the project structure, and conduct educational and research work. In project work, students plan the work, carry it out, draw conclusions, and make a presentation on the results of the work. Project work serves to develop proposals and develop creative activity in students.

The content of the practical assignment is represented by a list of equipment related to the topic of the lesson, text, pictures, graphs or tables related to the topic of the lesson. Students complete the assigned tasks using the recommended equipment, text, map, pictures, graphs and tables and present their conclusions. Practical assignments can be within the topics covered or cover interdisciplinary connections. The role of extracurricular activities, conferences, and evenings organized outside the classroom is invaluable in teaching students to think independently and work creatively. Extracurricular activities are a type of activity that is organized under the

direct supervision of a teacher, based on a plan, with a specific goal in mind, and taking into account the wishes of students. The goals and objectives of extracurricular activities are: To develop students' knowledge level and scientific outlook; To increase students' interest in science; To develop their specific characteristics in their work; To develop students' personal abilities; To form practical skills and qualifications in students; To direct students to a profession based on their abilities.

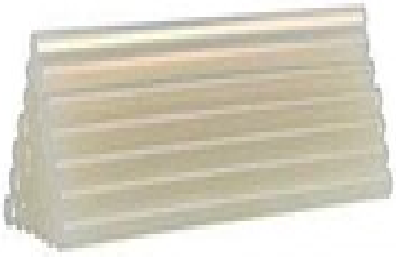
Project: Making a bridge out of pasta. Project goal: At least in real life, taking advantage of the opportunity to create a vision of durable, high-quality, low-cost, bridge-based living in students and to arouse interest in the professions of architecture, construction, and engineering. **Physics knowledge:** The student can correctly determine the center of mass, know and apply information about gravity, tension, and equilibrium conditions. **Mathematical knowledge:** The student can correctly select various geometric shapes and their sizes, paying attention to symmetry. Can perform calculations based on the selected shapes and drawings. **Look at the picture:** In 1292, Marco Polo brought pasta from China to Italy. But it is not known when it first appeared; Pasta is named after an entrepreneur named Marco Aro; In Italy, all pasta dishes are called "pasta" (dough for pasta**).**

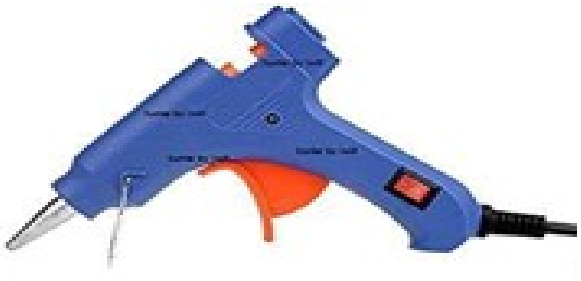
Stage 1: Problem situation: Pose a problem to the listener and identify ways to solve it - What is the function of a bridge? Why is it necessary to build a bridge? What should be considered when building a quality bridge? What should be considered to build a strong bridge?

Stage 2: Technology of dividing the group into groups of 5. Professions: Physicist, Mathematician, Architect, Computer Scientist, Designer**.** ***Working in groups: Stage 3: Each student contributes to the project work:*** Searches for solutions to problems; Calculates raw materials; Creates a model; Compiles and presents an algorithm for the work to be done; Pays attention to aesthetics and advertising. ***Requirements:*** The length of the bridge must be at least 40 cm; The width of the bridge must be 10 cm; The construction of the bridge must cost a maximum of 15 thousand soums; The bridge must be able to carry a load weighing at least 5 kg; It must have an aesthetic appearance; It must be economical.

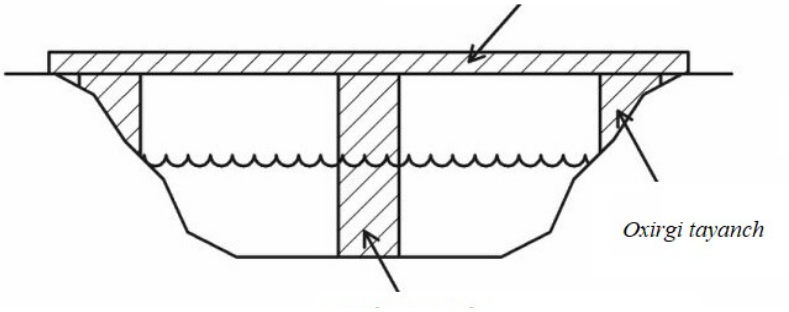
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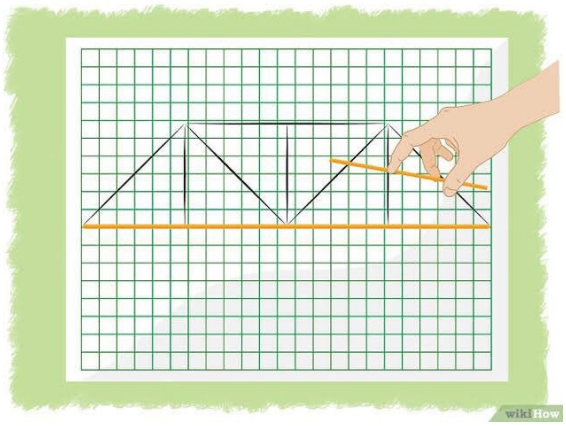


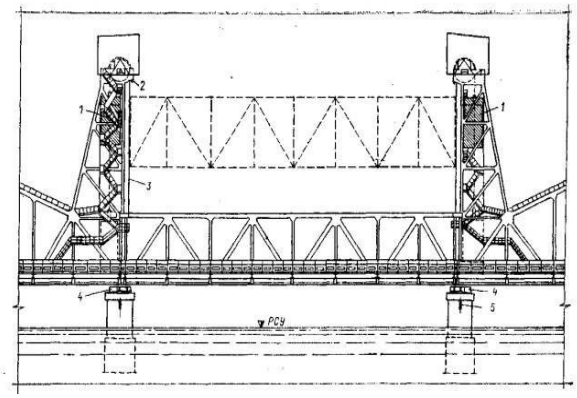


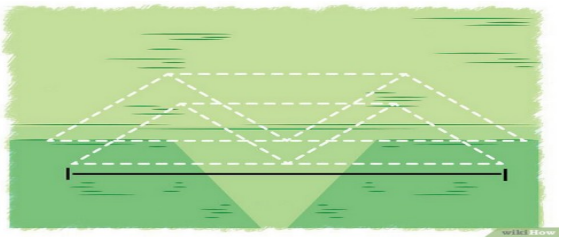
How are bridges made?
upper part

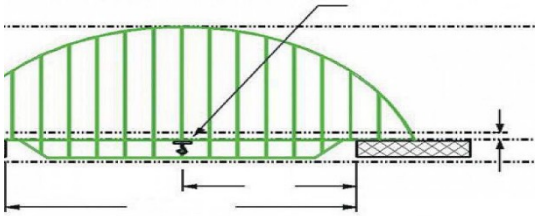


intermediate support **last stand**









The pasta bridge is ready



Troubleshooting: If any defects are observed in the bridge, if the bridge is leaning or its center of mass is incorrectly selected, they determine ways to eliminate it.

Questions: Why do you think a bridge is needed and what kind of work can be done with it? What do you think the bridge should look like? What is the importance of physics in completing this project? What is the importance of mathematics in completing this project? To evaluate the prepared model, we can make a table in the following form. This table lists the aspects of the model and writes the scores assigned to it. ***Evaluation***

Terms	Group name	Score
Model beauty		

Model durability		
Correct operation of the model		
Savings in model preparation		
Total points:		

Total points:

The main tasks of natural sciences are to develop a system of theoretical and practical knowledge about the essence, causes and interrelationships of phenomena and processes occurring in nature, the stages of development of nature, including the evolution of living organisms, the natural scientific foundations of modern technology and equipment, the interrelationship and influence of nature and society, the scientific foundations of the economical use of natural resources, the principles of effective management and control of economic processes, and the essence and importance of a healthy lifestyle.

A student's intrinsic motivation plays an important role in their interest in mastering natural sciences, their ability to understand the state of the natural and social environment through them, their ability to understand environmental and human problems, and their ability to make decisions to find solutions to them. The integration of disciplines creates a basis for students to perceive nature as a whole, and for the emergence of a single natural-scientific picture of the world in their thinking. At the same time, interdisciplinary integration is aimed at developing in students an understanding of the opportunities and problems of modern scientific and technological progress, the essence of environmental problems, ways of rational use of nature, and the principles of adhering to a healthy lifestyle, and the skills to use them in everyday life.

Based on STEAM education, it aims to develop students' interest in conducting educational research, conducting experiments, and designing-oriented creativity in the natural sciences, demonstrating the relevance of their acquired knowledge, skills, and competencies to everyday life, and developing their interest in creating innovations. One of the main tasks of the teacher is to instill in the minds of the younger generation practical exercises, laboratory work, and practical tasks that encourage independent performance and creative thinking, designed to work with tasks that meet the requirements of the international assessment program (PISA, TIMSS) aimed at developing students' logical thinking and practical skills.

Conclusion and recommendations

In teaching natural sciences, not only their internal integration with each other, but also their external integration with related disciplines is of great importance. In particular, their close interaction with the following scientific areas is important:

Competencies formed through native language and reading subjects play an important role in teaching natural sciences in developing students' creative thinking, developing the skills to express their views fluently in writing and orally, using scientific terms correctly, and teaching them to communicate freely in the process of debate.

The skills taught in the subject of mathematics are important for solving problems related to mathematical measurements and calculations in natural science classes, finding the most optimal solution, and making the right decisions during laboratory and other experiments.

Informatics and information technology create enormous opportunities for improving the efficiency of the teaching process of natural sciences through the use of various forms of information and communication technologies and computer equipment.

The competencies acquired through the subject of technology are of high professional importance in the process of teaching natural sciences, in guiding students towards a profession, developing their technical creative abilities, and in forming the skills to prepare creative projects. The natural sciences subject forms scientific and practical concepts in students about natural and socio-economic objects, processes and phenomena, the natural conditions and resources of our Motherland, its population and economy, the geographical foundations of the relationship between nature and man, global and regional problems of rational use and protection of nature, teaches independent thinking, and the practical application of geographical knowledge. In the process of teaching science, special attention is paid to the formation of students' skills in using maps and ecological literacy. At the same time, the concepts and competencies formed as a result of teaching primary school natural sciences serve to form a comprehensive picture of the objects, phenomena, and processes studied in other natural sciences.

Biology subjects form in students a sense of the objects and systems of living nature, the connections between living and inanimate nature. They acquire skills in solving problems of the living environment, and the socialization of students improves. At the same time, a positive attitude towards the living nature surrounding us, preserving natural diversity, as well as a strong sense of responsibility are formed. As a recommendation, STEAM education should enable students to acquire the scientific awareness competency of planning, designing, and proposing methods for conducting various studies on natural phenomena and processes observed in everyday life. As a practical competency, we need to educate students to independently master the skills of observing events, conducting presentations, experiments and projects, measuring necessary quantities using instruments (stopwatch, scales, measuring tape, thermometer, etc.), performing calculations, observing safety rules and using them rationally when using various equipment, knowing the factors that negatively affect the environment and ecology, thinking creatively and logically in daily activities, consciously planning their intellectual development, and monitoring and evaluating the results of their educational activities.

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THE ROLE OF THE TEACHER'S PERSONALITY IN DEVELOPING EMOTIONAL LEADERSHIP IN PRIMARY SCHOOL CHILDREN

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Abstract. *This article examines the pedagogical significance of the teacher's personality in fostering emotional leadership among primary school students. The research is based on the idea that the development of emotional leadership in early school years depends not only on a child's individual characteristics but also on the teacher's emotional, communicative, and moral influence. The article analyzes the conceptual essence of emotional leadership, the age-related psychological characteristics of young students, and the mechanisms through which a teacher's personality influences children's initiative, empathy, self-regulation, emotional responsiveness, and social participation. The study employed methods of theoretical analysis, comparative interpretation, systematization, and pedagogical generalization. The results show that in primary education, the teacher's emotional culture, communication style, pedagogical support, fairness, and personal example serve as the leading determinants in the formation of emotional leadership. The article offers practical pedagogical recommendations for integrating the development of emotional leadership into classroom interactions and educational practices.*

Keywords: *teacher personality; emotional leadership; primary school children; emotional intelligence; pedagogical interaction; social-emotional development; leadership qualities; primary education.*

Introduction. The modern educational paradigm increasingly emphasizes the need to cultivate individuals who are not only knowledgeable but also emotionally mature, socially active, and proactive. In this context, the issue of fostering leadership in schoolchildren has acquired new pedagogical significance. Modern leadership in education is no longer understood merely as power, dominance, or organizational control; rather, it is increasingly associated with emotional maturity, empathy, responsibility, self-management, cooperation, and the ability to positively influence others. This broader, more humanistic concept is reflected in the notion of emotional leadership. The primary school age is a particularly crucial stage in the development of a child's emotional, social, and personal identity. At this age, children are highly receptive to adult influence, emotionally responsive in social interactions, and have a strong inclination to imitate significant figures. Consequently, the educator holds a distinctive place in the child's developmental environment. Beyond being an instructor, the teacher acts as an emotional mediator, a behavioral role model, and an orchestrator of classroom relationships.

The teacher's formative influence extends beyond imparting knowledge. Through daily communication, emotional engagement, interaction styles, and value-based actions, the teacher directly influences how children learn to express themselves, cooperate with peers, manage their emotions, and take socially constructive initiative. These qualities are essential for the emergence of emotional leadership.

Therefore, studying the teacher's personality as a factor in developing emotional leadership in primary school students is relevant from both a scientific and a pedagogical perspective.

The purpose of this article is to substantiate the role of the teacher's personality in fostering emotional leadership among primary school students and to identify the pedagogical conditions and practical mechanisms that support this process.

Scientific Novelty of the Research

The scientific novelty of the research consists of the following:

1. The concept of emotional leadership, in relation to primary school students, is reinterpreted not as a form of pedagogical-organizational superiority, but as a set of emotional, communicative, and socially constructive behaviors.

2. The teacher's personality is understood as a multifaceted developmental factor, encompassing emotional culture, communication style, pedagogical tact, empathy, fairness, and the management of classroom interactions.

3. A structural link is established between the pedagogical influence associated with the teacher and the manifestations of emotional leadership in children: empathy, initiative, emotional regulation, responsibility, and cooperative behavior.

4. The practical pedagogical conditions for the purposeful formation of emotional leadership within the primary school educational environment are systematized.

Materials and Methods

This study is theoretical and analytical in nature, based on the interpretation of pedagogical and psychological literature on leadership, child development, emotional intelligence, and teacher-student relationships.

The following methods were used:

• analysis of scholarly literature;
• comparative pedagogical analysis;
• systematization and classification of theoretical positions;
• generalization of pedagogical experience;
• interpretive analysis of the formation of emotional leadership in the context of primary education.

The methodological basis of the study includes the following:

• a person-centered approach;
• an activity-based approach;
• a humanistic approach to education;
• a competency-based pedagogical framework.

These approaches made it possible to study the teacher's personality not only as a system of individual characteristics but also as a pedagogical resource that directly influences the emotional and social development of students.

Theoretical Foundations of Emotional Leadership

1. The Essence of Emotional Leadership

Emotional leadership is understood as an individual's ability to regulate their personal feelings, understand the emotional states of others, establish constructive communication, and positively influence group dynamics through emotionally competent behavior. In the context of primary school education, emotional leadership is expressed not through authority or prestige, but through empathy, emotional self-regulation, supportive actions, initiative, peer support, cooperation, and socially appropriate influence.

Thus, emotional leadership in children should be understood not as a formal leadership position, but as a developing socio-emotional ability.

2. Age Characteristics of Primary School Children

The early school years are a highly favorable period for the formation of emotional leadership due to the following developmental characteristics:

• an increased need for approval and recognition;
• a tendency to imitate adults;
• the active formation of self-esteem;
• emotional sensitivity and impressionability;
• the growing importance of peer relationships;
• the emergence of social responsibility and role-based behavior.

These characteristics create pedagogical opportunities for the targeted development of emotionally constructive leadership qualities within the educational process.

Results and Analysis

1. Teacher Personality as a Developmental Determinant

The results of the theoretical analysis show that a teacher's personality influences the formation of emotional leadership in primary school students through a series of interconnected pedagogical aspects.

1.1. Personal Example and Emotional Modeling

A teacher acts as a living model of emotional behavior. Children observe and internalize the teacher's emotional reactions, communication style, attitude toward mistakes, fairness in assessment, approach to conflict, and respect for others.

If a teacher consistently demonstrates patience, kindness, emotional balance, and respect, children are more likely to replicate these qualities in their peer relationships and classroom activities.

1.2. Classroom Climate and Emotional Safety

A psychologically safe classroom environment is a prerequisite for developing emotional leadership. The teacher's personality determines whether the classroom atmosphere is supportive or intimidating, cooperative or competitive, democratic or authoritarian.

A supportive emotional environment encourages children to express themselves, take initiative, assume responsibility, and build trusting relationships with others. Such an environment creates a fertile ground for the emergence of emotionally mature leadership behaviors.

1.3. Pedagogical Communication

Teacher-student communication plays a central role in developing children's emotional and leadership abilities. In the process of pedagogically meaningful communication, students develop skills in active listening, verbal confidence, emotional reflection, perspective-taking, and constructive self-expression.

The teacher's communication style either facilitates or hinders a child's readiness to positively influence those around them.

1.4. Encouragement and Recognition

Recognizing emotionally constructive behavior strengthens children's motivation and self-confidence. When a teacher notices and reinforces actions such as helping peers, resolving conflicts, responsibly leading group work, or showing empathy, these behaviors gradually develop into stable personal qualities.

Thus, emotional leadership develops more effectively in classrooms where teachers intentionally value not only academic outcomes but also socio-emotional contributions.

Pedagogical Conditions for Forming Emotional Leadership

The study found that the following pedagogical conditions are of particular importance for fostering emotional leadership in primary school students:

1. an emotionally supportive classroom environment;
2. the teacher's emotional competence and democratic conduct;
3. dialogic and respectful communication;
4. collaborative learning activities;
5. reflective and value-oriented learning tasks;
6. regular encouragement of initiative and social behavior.

These conditions should be embedded in both the educational and formative aspects of primary school practice.

Practical Mechanisms for Implementation

Emotional leadership can be developed using specialized pedagogical tools and methods, including:

- group and pair work;
- role-playing and situational exercises;
- classroom discussions and emotional reflection activities;
- peer support exercises;
- rotating leadership roles in group assignments;
- emotionally meaningful classroom tasks;
- "leadership of kindness" and "partner support" practices.

Such methods allow children to practice exerting constructive emotional influence in real educational situations.

Table 1. Relationship Between Teacher Personality Traits and Emotional Leadership Indicators in Primary School Children

Teacher Personality Factor	**Pedagogical Manifestation**	**Emotional Leadership Outcome in Children**
Emotional self-regulation	Calm and balanced behavior in classroom situations	Emotional stability and self-control
Empathy	Understanding children's emotional states	Compassion and sensitivity to peers
Fairness	Equal and respectful treatment of all learners	Trust, confidence, and social responsibility
Communicative openness	Encouraging dialogue and active participation	Verbal initiative and leadership in communication
Supportive feedback	Positive reinforcement of constructive behavior	Increased confidence and willingness to lead
Pedagogical tact	Respectful correction and guidance	Emotional resilience and adaptive behavior
Cooperative teaching style	Use of teamwork and shared tasks	Group responsibility and collaborative leadership

Teacher Personality Factor	Pedagogical Manifestation	Emotional Leadership Outcome in Children
Positive emotional climate creation	Safe and inclusive classroom atmosphere	Social participation and emotionally healthy influence

Interpretation of the Table

As the table shows, the teacher's personality does not have an indirect or abstract influence on emotional leadership; rather, it affects the specific behaviors and emotional outcomes observed in children's interactions, self-expression, and participation in the group. This confirms the pedagogical significance of the teacher's personality as a structural and developmental resource.

Discussion

The analyses conducted affirm that the teacher's personality must be recognized as one of the key pedagogical factors in fostering emotional leadership among primary school students. Emotional leadership does not arise solely from a child's innate dispositions or isolated educational events. It develops gradually through continuous pedagogical interaction, emotionally meaningful communication, and the socio-emotional structure of classroom life.

The results indicate that emotional leadership should not be narrowly interpreted as formal authority or extroverted behavior. In many cases, emotionally mature leadership in children manifests through empathy, calm mediation, supporting others, responsibility, moral influence, and emotionally balanced participation.

This implies that teachers must be able to identify diverse forms of leadership and create equal opportunities for their development.

The discussion also highlights the need to reconsider traditional views on classroom leadership. Instead of rewarding only conspicuous assertiveness or academic excellence, educational practices should value emotional maturity, collaboration, and constructive peer influence as essential dimensions of leadership.

Furthermore, the findings underscore the importance of teacher preparedness. If teachers are expected to cultivate emotional leadership in children, they themselves must possess emotional competence, a culture of communication, pedagogical flexibility, and reflective awareness.

Practical Recommendations

For Teachers

1. Model emotionally balanced and respectful behavior in all classroom situations.
2. Encourage children's initiative not only in academic tasks but also in socio-emotional contexts.
3. Use praise judiciously to foster empathy, cooperation, and responsibility.
4. Create opportunities for every child to assume an emotionally meaningful leadership role.
5. Incorporate reflective questions into daily classroom practice.

For Schools

1. Integrate the development of socio-emotional leadership into educational planning.
2. Organize training for teachers on emotional intelligence and classroom communication.
3. Promote a democratic and inclusive classroom culture.
4. Encourage classroom activities that require collaboration, mutual support, and shared responsibility.

For Pedagogical Education Institutions

1. Strengthen the preparation of future teachers in socio-emotional pedagogy.

2. Integrate the development of emotional leadership into pedagogical training modules.

3. Develop practical methodological guidelines for fostering emotional leadership in primary grades.

Practical Significance of the Research

The practical significance of the research lies in the following theoretical conclusions and pedagogical recommendations:

• teaching practice in primary grades;

• training and advanced training courses for teachers;

• classroom management and educational planning;

• development of socio-emotional education programs;

• research and methodological work in pedagogy.

Also, the obtained results can serve as a theoretical basis for future empirical research aimed at measuring the development of emotional leadership in schoolchildren.

Conclusions

Based on the theoretical and pedagogical analysis conducted, the following conclusions have been reached:

1. Emotional leadership is a developmental construct of pedagogical significance that should be purposefully cultivated in the primary school years.

2. In this process, the teacher's personality serves as the central developmental mechanism through emotional modeling, shaping the classroom environment, pedagogical communication, and motivational support.

3. The development of emotional leadership in children is particularly influenced by teacher-related qualities such as empathy, emotional self-regulation, fairness, communicative openness, pedagogical tact, and supportive interaction.

4. Emotional leadership in primary school students is formed effectively when educational interactions are based on trust, cooperation, emotional safety, support for initiative, and value-oriented communication.

5. The education system should view the teacher not only as a transmitter of knowledge but also as the key personal factor in a child's socio-emotional and leadership development.

In conclusion, the role of the teacher's personality in shaping emotional leadership is both foundational and transformative. The formation of an emotionally mature, empathetic, proactive, and socially responsible individual begins with the personal and pedagogical influence of the teacher. Therefore, strengthening the emotional and communicative competence of primary school teachers should become one of the strategic priorities of modern education.

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PRINCIPLES AND REGULATORY FRAMEWORK OF INCLUSIVE EDUCATION IN THE REPUBLIC OF UZBEKISTAN

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Abstract. *The article examines the principles and regulatory framework of inclusive education in the Republic of Uzbekistan in the context of modernization of the national education system. The study analyzes key legislative and regulatory documents governing the organization of inclusive education, as well as scholarly approaches of Uzbek researchers to understanding the essence and objectives of inclusion. Special attention is paid to the principles of equal access to education, individualization of learning, and social integration of children with special educational needs. The significance of regulatory support in creating a sustainable inclusive educational environment and improving the quality of general education is substantiated.*
Keywords: *inclusive education, Republic of Uzbekistan, regulatory framework, principles of inclusion, equal access to education, special educational needs.*

It is generally believed that in modern pedagogical and social science, inclusive education is considered a priority area for the development of national educational systems, aimed at ensuring equal rights and opportunities for all children, regardless of their physical, intellectual, mental, or social disabilities. The inclusive approach is based on the recognition of the value of diversity in child development, the rejection of discriminatory practices, and the creation of conditions for the full participation of every child in the educational process.

In the Republic of Uzbekistan, the establishment and development of inclusive education is determined by a complex set of socioeconomic, legal, cultural, and pedagogical factors. The modernization of the general education system, aimed at improving its accessibility, quality, and social relevance, is of significant importance in this process. State educational policy is increasingly focused on the principles of humanization, individualization of education, and consideration of the special educational needs of children, reflecting the transition from a segregated education model to inclusive educational practices. The development of inclusive education in Uzbekistan is also linked to the implementation of international legal norms and recommendations that enshrine the right of every child to education without discrimination. This primarily concerns the provisions of the UN Convention on the Rights of the Child and the Convention on the Rights of Persons with Disabilities, which have become important benchmarks for reforming the national education system. In this context, inclusive education is viewed not only as a pedagogical technique but also as a social institution that ensures the integration of children with special educational needs into society. It is well known that distinctive feature of the current stage of inclusive education development in the Republic of Uzbekistan is the phased nature of its implementation, which involves improving the regulatory framework, developing the infrastructure of educational institutions, training teachers, and fostering an inclusive culture in the educational environment. Moreover, inclusion is understood not as a child's formal presence in a

mainstream school, but as a purposeful process of creating conditions for their successful learning, socialization, and personal development.

Therefore, inclusive education in Uzbekistan serves as an important tool for implementing the principles of social justice and equal opportunity, reflecting the state's commitment to building a humane and open education system focused on the needs of every child and consistent with modern international educational standards. Scientific works by Uzbek researchers emphasize that inclusive education should be viewed not only as a pedagogical innovation but also as a socio-cultural phenomenon reflecting the level of humanization of society and its readiness to embrace diversity [4; 6]. The essence of inclusion lies in creating learning conditions in which every child can be included in the general educational process and receive the support necessary for successful mastery of educational programs and socialization. The key principles of inclusive education in the Republic of Uzbekistan are equal access, non-discrimination, individualization of education, social integration, and comprehensive support for students. The principle of equal access recognizes the right of every child to receive an education in a general education school in their place of residence, regardless of health status or developmental level. This principle is consistent with the provisions of international documents and is reflected in the national legislation of the Republic of Uzbekistan [8]. The principle of individualization of education is focused on taking into account the special educational needs of students and involves adapting educational content, teaching methods, and assessment forms. Uzbek educators note that implementing this principle requires the introduction of adapted educational programs, the use of specialized teaching tools, and close collaboration between teachers, psychologists, special education teachers, and social workers [5]. Inclusive education increases the importance of teachers' professional competence and their ability to flexibly adapt the educational process to the individual needs of children.

It is broadly understood that principle of social integration aims to include children with special educational needs in active school and social life. Coeducation fosters tolerance, empathy, and mutual respect among students and reduces the risk of social exclusion for children with disabilities. Research conducted in mainstream schools in Uzbekistan confirms that an inclusive educational environment has a positive impact on both children with special needs and their peers [7]. The regulatory framework for inclusive education in the Republic of Uzbekistan is based on a combination of international obligations and national educational development priorities. The fundamental regulatory document is the Law of the Republic of Uzbekistan "On Education" (2020), which enshrines inclusive education as one of the forms of realizing citizens' right to education. The law defines the state's responsibilities for creating conditions for the education of children with special educational needs in the general education system and developing mechanisms for their psychological and pedagogical support. From significant importance for the development of inclusive education is the Decree of the President of the Republic of Uzbekistan dated October 13, 2020, No. PF-4860, "On measures to further improve the education system for children with special educational needs." The document defines strategic directions of state policy in the field of inclusion, including the phased implementation of inclusive practices in general education schools, the training and retraining of teaching staff, the modernization of infrastructure, and the development of interdepartmental cooperation.

The practical implementation of inclusive education is also regulated by decrees of the Cabinet of Ministers of the Republic of Uzbekistan, in particular, Decree No. 638 of October 12, 2021, which establishes the procedure for organizing the education of children with special educational needs, requirements for learning conditions, and mechanisms for monitoring the

quality of educational services. These regulations create the legal basis for the transition from experimental forms of inclusion to its systemic implementation nationwide. Thus, the principles and regulatory framework for inclusive education in the Republic of Uzbekistan form a comprehensive and multi-layered system of legal, organizational, and pedagogical conditions aimed at ensuring equal access to quality education and the full social integration of all categories of children, including students with special educational needs. This system is based on humanistic values, non-discrimination, and recognition of the uniqueness of each child as a subject of the educational process. Regulatory documents governing inclusive education set strategic guidelines for the development of educational institutions, define mechanisms for interdepartmental cooperation, and establish the responsibility of the state and society for creating an accessible and adapted educational environment. Collectively, they provide legal guarantees for the realization of the constitutional right to education, facilitate the institutionalization of inclusive practices, and develop sustainable models for supporting children with special educational needs within the general education system. Implementing the principles of inclusive education requires not only updating the content and technologies of instruction, but also transforming the professional stance of teachers, developing their inclusive competencies, and their readiness to work in a context of educational diversity and collaboration with students' families. In this context, fostering an inclusive culture within educational organizations, based on respect, acceptance, and support for children's individual differences, is of particular importance. It is widely considered that consistent implementation and practical enforcement of legal and regulatory provisions in the field of inclusive education contributes to improving the quality of educational services, expanding opportunities for social adaptation and self-realization for children, and strengthening social cohesion and tolerance in society. Thus, inclusive education in the Republic of Uzbekistan is an integral component of the sustainable development of the national education system and an important condition for building a socially oriented state focused on the principles of equality, justice, and humanism.

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THE ROLE OF STRATEGIC MANAGEMENT IN THE DEVELOPMENT OF CORPORATE GOVERNANCE CULTURE IN HIGHER EDUCATION INSTITUTIONS

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Abstract. *This article examines the role of strategic management in the development of corporate governance culture in higher education institutions under conditions of systemic transformation in higher education. The study analyzes contemporary factors influencing university activity, including increasing competition, the digitalization of management processes, changing labor-market requirements, and the expansion of institutional autonomy. The need to use strategic management as an instrument for forming an effective corporate governance culture is substantiated. The interrelationship between strategic leadership, stakeholder engagement, corporate behavior, and the effectiveness of university management is identified. Based on the analysis, a conceptual model for developing corporate governance culture through strategic management is proposed. The proposed model is aimed at improving the performance of higher education institutions, enhancing management processes, and strengthening the long-term competitiveness of universities.*

Keywords: *corporate governance, corporate governance culture, strategic management, strategic leadership, higher education, university, management effectiveness, competitiveness.*

Introduction

The current stage in the development of the higher education system is characterized by growing competition among educational institutions, the expansion of university academic independence, the digital transformation of management processes, and increasing requirements for the quality of educational services. Under these conditions, the effectiveness of higher education institutions increasingly depends not only on resource provision and the quality of educational programs, but also on the maturity of management mechanisms that ensure the achievement of strategic development goals [8].

In recent years, the Republic of Uzbekistan has been implementing large-scale reforms aimed at modernizing the higher education system. The expansion of the network of higher education institutions, the increase in youth participation in higher education, the development of international cooperation, and the strengthening of institutional autonomy create new requirements for the organization of university management activities [1,2]. At the same time, the increasing complexity of the external environment requires university leaders to respond to change in a timely manner, take into account the interests of different groups involved in the educational process, and ensure the sustainable development of the educational organization.

Corporate governance occupies an important place in addressing these tasks. It may be understood as a system of relationships among governing bodies, employees, students, and other stakeholders based on the principles of responsibility, transparency, participation, and strategic orientation. Practice shows that the effectiveness of corporate governance is largely determined by

the level of development of corporate governance culture, which influences the quality of decision-making, the nature of internal communication, and the degree to which participants in the educational process are involved in achieving the university's goals [6].

The analysis of scholarly literature indicates that certain aspects of corporate governance and corporate culture in higher education institutions have been studied rather extensively. Nevertheless, the influence of strategic management on the development of corporate governance culture remains insufficiently explored. Existing studies mainly focus on organizational structures, regulatory mechanisms, and management effectiveness, whereas the role of strategic management as an instrument for shaping corporate governance culture requires further investigation [4,5].

In the context of increasing competition, changes in the labor market, the development of digital technologies, and the expansion of university autonomy, there is a need to study mechanisms that ensure the integration of the university's strategic development goals with corporate values, norms, and management practices.

The aim of this study is to determine the role of strategic management in the development of corporate governance culture in higher education institutions and to develop a conceptual model for forming corporate governance culture on the basis of a strategic approach to management.

Materials and Methods

The theoretical basis of the study consists of scholarly works by national and international researchers devoted to corporate governance, corporate culture, strategic management, and the management of higher education institutions. During the research process, contemporary approaches to the development of corporate governance in organizations were examined, as were the specific features of applying strategic management within the higher education system.

The information base of the study included the regulatory and legal documents of the Republic of Uzbekistan governing the activity of higher education institutions, materials from scholarly publications on corporate governance and the strategic development of universities, and research findings in the field of educational organization management.

A set of general scientific research methods was used to achieve the stated aim. The methods of analysis and synthesis were applied in reviewing the scholarly literature and identifying the theoretical foundations of corporate governance in higher education institutions. A systems approach was used to examine corporate governance culture as an interrelated set of values, norms, organizational mechanisms, and management practices. Comparative analysis made it possible to identify the specific features of the influence of strategic management on the processes of developing corporate governance culture under conditions of higher education transformation. Logical generalization and scientific abstraction were used in developing a conceptual model for the development of corporate governance culture on the basis of a strategic approach to management.

Results and Discussion

The development of the higher education system under contemporary conditions is accompanied by changes in approaches to university management. Whereas the effectiveness of an educational organization was previously determined largely by the amount of available resources and compliance with established regulatory requirements, today increasing importance is attached to the ability to adapt to changes in the external environment, the quality of managerial decisions, and the level of involvement of participants in the educational process in achieving the university's strategic goals [6].

One of the most significant factors influencing the activity of higher education institutions is the intensification of competition in the educational services market. The expansion of the network of public and non-state universities, the development of international educational cooperation, and the growth of academic mobility create conditions under which universities must constantly improve the quality of educational services and increase their attractiveness for applicants, academic staff, and partners. Under such conditions, corporate governance culture ceases to be merely an internal organizational phenomenon and becomes an important factor in the competitiveness of an educational institution [3].

The transformation of the labor market also has a substantial impact on university activity. Contemporary employers are interested not only in graduates' professional knowledge but also in the development of practical competencies, communication skills, the ability to work in a team, make independent decisions, and adapt quickly to new conditions. These changes require universities to interact more closely with employers, revise management approaches, and create an organizational environment oriented toward continuous development and the implementation of innovation.

Alongside external factors, internal processes taking place in higher education institutions are also important. The increase in student enrollment, the growing workload of academic staff, the need to digitalize the educational process, and higher requirements for the quality of research activities generate new demands on the university management system. In this context, issues related to the distribution of responsibility, the coordination of structural units, and the establishment of effective interaction among all participants in the educational process become especially relevant [4].

It should be noted that the effectiveness of corporate governance depends to a considerable extent on the level of development of corporate governance culture. Corporate governance culture determines the nature of relationships among university leadership, faculty members, staff, and students; forms shared approaches to decision-making; promotes the development of trust; and strengthens organizational identity. The absence of common value orientations, insufficient transparency in management processes, and a low level of employee involvement can substantially reduce the effectiveness of even a well-designed organizational structure [7].

In modern universities, corporate governance culture should ensure not only compliance with internal norms and rules but also support for strategic transformation. For this reason, issues related to the development of corporate culture are closely connected with strategic management. Strategic management makes it possible to determine the long-term development orientations of an organization, form a shared vision of the future, coordinate the interests of different participant groups, and create the conditions necessary to achieve established goals.

Unlike the traditional administrative approach, which is mainly focused on solving current tasks, strategic management presupposes the systematic planning of university development, continuous analysis of changes in the external environment, and timely adjustment of managerial decisions. Such an approach contributes to the formation of a culture of responsibility, increases the openness of management, and develops partnership relations among all participants in the educational process [8].

Strategic leadership by university management plays a special role in this process. Leadership forms the organization's system of values, determines priority areas of development, and ensures the integration of strategic goals into the daily activities of structural units. When a clearly formulated strategy is in place, employees better understand the aims of their work,

recognize their own role in university development, and demonstrate greater interest in achieving common results.

Consequently, the development of corporate governance culture should be regarded as one of the key factors in improving the effectiveness of higher education institutions. In turn, strategic management functions as an instrument that ensures the formation and development of corporate governance culture by integrating strategic goals, corporate values, and management practices into a unified university management system [7].

The analysis conducted in this study allows strategic management to be considered one of the key instruments for developing corporate governance culture in higher education institutions. In contrast to the traditional approach, which is based mainly on administrative regulation and the performance of current tasks, strategic management creates conditions for the formation of a unified managerial space oriented toward achieving the university's long-term development goals.

The study shows that the development of corporate governance culture is shaped by several interrelated factors. The external environment generates a system of challenges associated with increasing competition, changes in labor-market requirements, the development of digital technologies, and the expansion of university academic autonomy. Responding to these challenges requires an educational organization not only to make operational managerial decisions but also to establish a stable system of values and norms of corporate behavior.

Under these conditions, strategic management occupies a central position, ensuring the coordination of the interests of different participants in the educational process and determining the directions of university development. The implementation of strategic goals requires the active participation of leadership, academic staff, administrative personnel, students, and other stakeholders. Such interaction helps strengthen trust within the organization and forms a culture of collective responsibility for the outcomes of university activity [3,4].

Based on the study, a conceptual model for the development of corporate governance culture in a higher education institution through strategic management was developed (Figure 1).



Figure 1. Conceptual model for developing corporate governance culture in a higher education institution on the basis of strategic management

According to the proposed model, the initial element consists of strategic challenges in the external environment that directly affect university activity. These include changes in the educational services market, the transformation of employers' requirements, digitalization processes, international competition, and reforms in the higher education system.

Under the influence of these factors, the university forms a strategic management system that includes the definition of its mission, vision, long-term goals, and priority areas of

development. At this stage, the basis is created for making managerial decisions and distributing responsibility among participants in the management process.

The next element of the model is strategic leadership by university management. Leaders at all levels act as transmitters of the university's strategic goals and ensure their integration into the everyday activity of structural units. Strategic leadership contributes to strengthening organizational unity, developing employee initiative, and maintaining a culture of open interaction.

An important condition for the development of corporate governance culture is the involvement of stakeholders in university management processes. The participation of employees, students, and partners in discussing issues of organizational development contributes to increased transparency in decision-making and the formation of a sense of shared involvement in achieving strategic goals.

The result of these mechanisms is the formation of corporate behavior based on the principles of responsibility, cooperation, openness, and orientation toward results. Corporate behavior reflects the practical manifestation of corporate governance culture and directly affects the effectiveness of the educational organization.

The final outcome of the model is the development of a corporate governance culture that ensures improved management quality, strengthened organizational sustainability, enhanced internal communication, and the increased competitiveness of the university in the long term.

The proposed model demonstrates that strategic management should be regarded not only as an instrument for planning university development but also as a mechanism for forming corporate governance culture, which ensures the effective functioning of a higher education institution in a dynamically changing external environment.

Conclusion

The analysis shows that the higher education system of the Republic of Uzbekistan operates under conditions of large-scale institutional transformation associated with expanding access to higher education, increasing competition among universities, the digitalization of educational processes, changing labor-market requirements, and the gradual expansion of the academic and financial independence of higher education institutions. Under these conditions, the need for modern management approaches is increasing, as such approaches ensure the sustainable development of universities and their adaptation to a dynamically changing external environment.

It has been established that traditional administrative methods of management are gradually losing their sufficient effectiveness because they do not fully account for the long-term challenges and risks involved in the development of educational organizations. In this regard, strategic management becomes particularly important, since it is oriented toward the formation of competitive advantages, the improvement of educational service quality, the development of human capital, and the long-term sustainability of universities.

At the same time, the effectiveness of strategic management is largely determined by the quality of the university's internal management mechanisms. Practice shows that strategic goals cannot be achieved solely through the development of programs and strategic plans. A necessary condition is the formation of a system of organizational relations that ensures the coherence of actions among all participants in the educational process, supports the implementation of the university's mission, and contributes to the achievement of common development goals.

In this context, corporate governance and corporate culture become especially relevant as instruments for improving the effectiveness of higher education institutions. Researchers note that a developed corporate culture contributes to the formation of a unified value space within the

university, increases the manageability of organizational behavior, strengthens competitive advantages, and supports the sustainable development of the educational organization.

In summarizing the findings, it should be noted that strategic management should be regarded as a necessary condition for the development of modern universities, whereas corporate governance and corporate culture function as essential mechanisms for the implementation of strategic goals. Therefore, further research on improving corporate governance in higher education institutions in Uzbekistan is a timely and scientifically grounded direction that can contribute to increasing management effectiveness, improving educational quality, and strengthening the competitiveness of the national higher education system as a whole.

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THE ROLE OF THE OLIGOPHRENOPEDAGOGUE IN THE SOCIAL INTEGRATION OF CHILDREN WITH SPECIAL EDUCATIONAL NEEDS

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Abstract. *This article analyzes the role of the special education teacher in facilitating the social integration of children with special educational needs, primarily those with intellectual disabilities. It examines contemporary scholarly approaches to understanding social integration and outlines the key professional activities of a special education teacher that promote the successful socialization, adaptation, and inclusion of a child into educational and social environments. Based on an analysis of native and international research, the article substantiates the need to transition from a compensatory model of special education to a model centered on social participation and the development of the child's personal agency.*

Keywords: *special education teacher, social integration, children with special educational needs, intellectual disabilities, socialization, inclusive education, social and life skills.*

In the modern context of the modernization of special and inclusive education systems, the issue of social integration of children with special educational needs has become particularly relevant. Social integration is viewed not only as the inclusion of a child in the educational environment, but also as a process of ensuring their full participation in social life, developing communication competence, independence, and readiness for social interaction.

For children with intellectual disabilities, this process is complicated by the specific characteristics of their cognitive activity, limited social experience, difficulties in communication, and insufficient development of social and daily living skills. In this regard, the role of the oligophrenopedagogue, who serves as the key specialist providing psychological and pedagogical support in the process of students' social integration, becomes especially significant.

The analysis of contemporary research indicates that the effectiveness of the social integration of children with special educational needs depends not so much on the severity of the disability itself, but rather on the quality of psychological and pedagogical support, the level of interdisciplinary cooperation among specialists, and the creation of a supportive social environment. Researchers identify early pedagogical intervention, the individualization of the educational process, cooperation between the family and educational institutions, and the development of life competencies in children as the key factors of successful integration.

Within the cultural-historical concept of personality development, particular attention is given to the social nature of higher mental functions. According to this theory, the social integration of a child with an intellectual disability is viewed as the result of their inclusion in a system of social relations through specially organized pedagogical activities.

Despite the positive developments in the field of inclusive education, a number of factors continue to hinder the successful social integration of children with special educational needs. These factors include the insufficient preparedness of teaching staff, the limited availability of practice-oriented socialization programs, the persistence of social stereotypes, and the inadequate

involvement of families in the corrective and pedagogical process. An analysis of scientific publications shows that although many specialists recognize social adaptation as a priority objective of their professional activities, not all of them are sufficiently prepared to implement integration technologies in practice.

The scientific novelty of the study is reflected in the following:

- The content of the concept of **"**social integration of children with intellectual disabilities" has been clarified from the perspectives of competency-based and socio-activity approaches.
- The main areas of the professional activity of the oligophrenopedagogue in the process of social integration of students with special educational needs have been systematized.
- The components of the oligophrenopedagogue's professional readiness to implement integration activities have been identified.
- A functional model of the oligophrenopedagogue's participation in the social integration of children with intellectual disabilities has been developed.
- The pedagogical conditions for increasing the effectiveness of integration processes in special and inclusive education have been substantiated.

RESEARCH MATERIALS AND METHODS.

The methodological foundation of the study was based on the principles of humanistic pedagogy, as well as competency-based, learner-centered, activity-oriented, and inclusive approaches to the education of children with special educational needs.

To achieve the objectives of the study, the following research methods were employed:

- **Theoretical methods:** analysis of psychological-pedagogical, defectological, and methodological literature; comparative analysis; systematization and generalization of scientific data.
- **Empirical methods:** pedagogical observation, questionnaire surveys, interviews, and expert assessment.
- **Statistical methods:** quantitative and qualitative processing of the research results.

The information base of the study consisted of regulatory and legal documents in the field of special and inclusive education, scientific publications by national and international scholars, as well as materials reflecting the practical activities of educational institutions.

RESULTS AND DISCUSSION

The social integration of children with intellectual disabilities is a multifaceted pedagogical process aimed at ensuring their active participation in social life, effective communication with peers, acquisition of independent living skills, and involvement in educational, occupational, and cultural activities. Social integration involves developing the child's existing potential, supporting their social adaptation, and assisting them in finding their place in society as equal members of the community.

From this perspective, the development of communicative, social, daily living, and adaptive skills in children with intellectual disabilities, ensuring the active involvement of their families, and creating an inclusive educational environment are considered key factors for their successful social integration

The conducted analysis demonstrated that the modern concept of social integration of children with intellectual disabilities requires a transition from a model of social adaptation to a model of active social participation. In this context, the oligophrenopedagogue becomes the key

specialist responsible for developing the child's life competencies and ensuring their involvement in various forms of social activity.

The study made it possible to identify the main functions of the oligophrenopedagogue in the process of students' social integration:

Diagnostic Function – involves assessing the child's level of social development, identifying the characteristics of their communicative activity, evaluating their social and daily living skills, and determining their adaptive capacities and potential for social adjustment.

Design Function – encompasses the development of individualized educational pathways, corrective-developmental programs, and technologies aimed at fostering life competencies.

Corrective and Developmental Function – focuses on enhancing cognitive activity, communicative competence, independence, and socially significant personal qualities.

Social-Mediating Function – ensures effective interaction and cooperation among the child, the family, the educational institution, and society.

Consultative Function – involves providing methodological support and guidance to parents and teachers on issues related to students' socialization and integration

The results of the analysis indicate that the effectiveness of social integration increases significantly only when all participants in the educational process cooperate in a comprehensive and coordinated manner. In this regard, collaboration between the family and the educational institution is of particular importance, as the family environment serves as the most crucial factor in reinforcing the social skills developed during the educational process.

Model of the Oligophrenopedagogue's Role in Social Integration

The proposed model includes four interrelated components:

Goal – to ensure the successful social integration of children with intellectual disabilities through the development of life competencies and social-daily living skills.

Content Component includes:

- the development of communication skills;
- the formation of social and daily living competenc
- the development of independence;
- preparation for social interaction and participation in social relationships;
- the formation of positive social experience.

Organizational and Activity Component предусматривает (includes) the use of:

- practice-oriented technologies;
- social role-playing games;
- situational modeling;
- project-based activities;
- family support and guidance technologies

Outcome Component

The effectiveness criteria include:

- the level of social adaptation;
- the level of the student's independence;
- the degree of development of communication skills;
- the level of social and daily living competence;
- readiness to participate in social life.

Pedagogical Conditions for Effective Social Integration

Based on the conducted analysis, the following pedagogical conditions were identified:

1. Developing the professional readiness of oligophrenopedagogues for integration activities.
2. Creating a corrective and developmental educational environment.
3. Implementing an individualized approach to education and upbringing.
4. Organizing interdisciplinary support for students.
5. Actively involving the family in the child's socialization process.
6. Using practice-oriented technologies for the development of life competencies.
7. Ensuring continuity and close interaction between the educational institution and the social environment.

CONCLUSION

The social integration of children with special educational needs is a complex and multifaceted process, the success of which largely depends on the professional activities of the oligophrenopedagogue. In modern conditions, the role of the oligophrenopedagogue extends beyond traditional corrective work and includes the functions of a coordinator, consultant, mediator, and organizer of social interactions.

The role of the oligophrenopedagogue in the social integration of children with special educational needs is of systemic importance. The oligophrenopedagogue acts not only as an organizer of corrective and developmental activities but also as a mediator between the child and society, creating the necessary conditions for the child's successful socialization and full participation in social life

The results of the analysis indicate that the effectiveness of the social integration of children with intellectual disabilities is directly dependent on the professional competence of the oligophrenopedagogue, particularly on their ability to provide interdisciplinary support, develop social and daily living skills, and create conditions that encourage the child's active participation in various spheres of social activity.

The findings also confirm the necessity of improving the system for training future oligophrenopedagogues, with particular emphasis on developing competencies related to fostering life skills, social adaptation, and the social integration of students with intellectual disabilities.

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METHODOLOGICAL REQUIREMENTS FOR ORGANIZING SYNTACTIC EXERCISES

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Abstract. *This article examines the methodological requirements for organizing syntactic exercises in primary-grade native-language lessons. The central problem addressed in the study is that young learners often acquire grammatical terms mechanically but do not always understand how morphological and syntactic concepts differ or how they work together in actual speech. The article therefore argues that syntax-focused exercises should not be treated as isolated grammar drills. They should be organized as a systematic, competence-oriented sequence that helps pupils recognize sentence boundaries, connect words grammatically, identify sentence parts, use punctuation meaningfully, and express complete ideas in oral and written form. Using a methodological-analytical design, the study synthesizes curriculum requirements, primary-language teaching principles, and grade-level exercise types for Grades 1-4. The results present a structured classification of syntactic exercises, a grade-wise progression of task complexity, and a systemic-pragmatic model for lesson organization. The proposed model connects didactic requirements, methodological actions, teacher facilitation, learner activity, and expected competencies. The article concludes that syntactic exercises are most effective when they are continuous, age-appropriate, communicatively meaningful, integrated with morphology, and supported by formative feedback. Such organization strengthens pupils' speech, linguistic, communicative, and self-development competencies while preparing them to use sentences consciously in real communication.*

Keywords: *syntax, syntactic exercises, primary education, native-language teaching, grammar instruction, communicative competence, methodology.*

1. Introduction

One of the most important tasks of native-language teaching at school is to help pupils master the rules and norms of using language units in meaningful communication. In primary education, this task is especially important because pupils are not only learning separate language facts; they are also learning how to express ideas accurately, coherently, and appropriately in speech situations. Native-language lessons therefore support both linguistic knowledge and communicative competence. They develop pupils' ability to understand the thoughts of others, formulate their own thoughts orally and in writing, and use language resources according to the purpose and context of communication.

Within this system, syntactic units occupy a central position. Syntax is the branch of linguistics that studies word combinations, sentences, sentence types, and the relations between sentence components. Teaching pupils to use the sentence consciously as a basic language unit means teaching them to divide the flow of speech into complete structural and semantic units, identify the subject of thought, connect words grammatically, and shape meaning through intonation and punctuation. Knowledge of phonetics, vocabulary, word structure, morphology,

spelling, and punctuation is also consolidated through syntactic practice because these areas become functional when pupils construct and interpret sentences.

Modern language education views language phenomena as a system of interconnected levels. Phonetics is often treated as the lowest level of language organization, whereas syntax represents one of the highest levels because it organizes words into meaningful statements. For this reason, language sections in primary grades should be taught in interrelation rather than as disconnected topics. While pupils form morphological concepts such as noun, adjective, numeral, verb, and pronoun, they should also learn how these words function within sentences. For example, a pupil's understanding of a noun becomes deeper when the pupil can recognize that the noun may serve as a subject, object, or other sentence component.

The practical difficulty is that many pupils, including some older learners, do not always distinguish morphological concepts from syntactic concepts. They may identify word classes but fail to understand the syntactic role of those words in a sentence. This confusion shows that the teacher needs a carefully selected methodological approach. One productive approach is to teach syntactic concepts together with their morphological foundations. In this approach, a word is not studied only as a part of speech; it is also studied as an element that enters into grammatical relations and performs a function in a sentence.

The need for a clear methodology is particularly relevant for primary-grade native-language lessons. Teachers require a system that shows which syntactic exercises should be used at each grade level, how the exercises should become gradually more complex, and which competencies should be formed through them. This article responds to that need by presenting methodological requirements for organizing syntactic exercises and by proposing a systemic-pragmatic model of lesson organization.

1.1. Research purpose and questions

The purpose of the article is to define the methodological requirements for organizing syntactic exercises in primary native-language education and to show how these requirements can be transformed into a practical model for classroom use. The article addresses the following questions:

- What didactic and methodological requirements should guide the organization of syntactic exercises in primary grades?
- How can syntactic exercise types be sequenced from Grade 1 to Grade 4 so that pupils move from simple sentence construction to conscious analysis and creative use?
- What model can help teachers connect syntactic concepts with communicative competence, linguistic competence, and pupils' independent speech development?

2. Methods

2.1. Research design

This article is a methodological and analytical study rather than an experimental study. It does not report classroom test scores or statistical outcomes. Instead, it systematizes curriculum-based requirements, primary-language teaching principles, and grade-level exercise practices in order to develop a coherent instructional model. This design is appropriate because the main objective is to clarify how syntactic exercises should be organized and what functions they should perform in lesson practice.

2.2. Source materials

The analysis is based on three groups of materials. The first group includes national curriculum requirements for the native-language subject, especially the requirement to develop

listening comprehension, speaking, reading, writing, and independent expression in different speech situations. The second group includes methodological literature on primary-grade language teaching and grammar instruction. The third group consists of the grade-wise exercise sequence described in the source article: answering questions, constructing sentences from pictures or given words, creating word combinations, restoring punctuation, analyzing sentence structure, identifying grammatical bases, drawing connection schemes, and producing short oral or written texts.

2.3. Analytical procedure

The source material was analyzed in four steps. First, the target syntactic concepts for primary grades were identified: word combination, simple sentence, sentence type according to communicative purpose, main sentence parts, secondary sentence parts without excessive terminology, homogeneous parts, and forms of address. Second, the exercise types were grouped according to grade level and cognitive complexity. Third, the requirements for effective organization were formulated by connecting didactic principles with practical teacher actions. Fourth, the systemic-pragmatic model was developed to show how aims, materials, methods, teacher support, learner activity, competencies, and expected outcomes are connected in a single instructional process.

2.4. Criteria for organizing syntactic exercises

The study used the following criteria to evaluate and organize the exercise system:

- Continuity: exercises should develop gradually from recognition and sentence construction to analysis, transformation, and creative production.
- Accessibility: tasks should match the age, language experience, and psychological development of primary school pupils.
- Integration: syntactic learning should be connected with morphology, vocabulary, spelling, punctuation, oral speech, and written speech.
- Communicativeness: exercises should lead pupils toward using sentences for real expression, not only toward naming grammatical terms.
- Learner activity: tasks should require pupils to observe, compare, ask questions, justify answers, and correct their own language use.
- Feedback: the teacher should help pupils generalize rules after practice and should provide clear, formative feedback.

3. Results

3.1. Main methodological requirements

The analysis shows that syntactic exercises should be organized through a combination of didactic and methodical requirements. Didactic requirements refer to the general principles of teaching: sequence, clarity, accessibility, activity, visual support, systematic repetition, and connection with pupils' real speech needs. Methodical requirements refer to concrete teacher actions during the lesson: specifying objectives, identifying pupils' previous morphological and syntactic knowledge, creating a problem situation, presenting material step by step, organizing discussion, using methodological materials, supporting pupils' independence, and providing feedback and generalization.

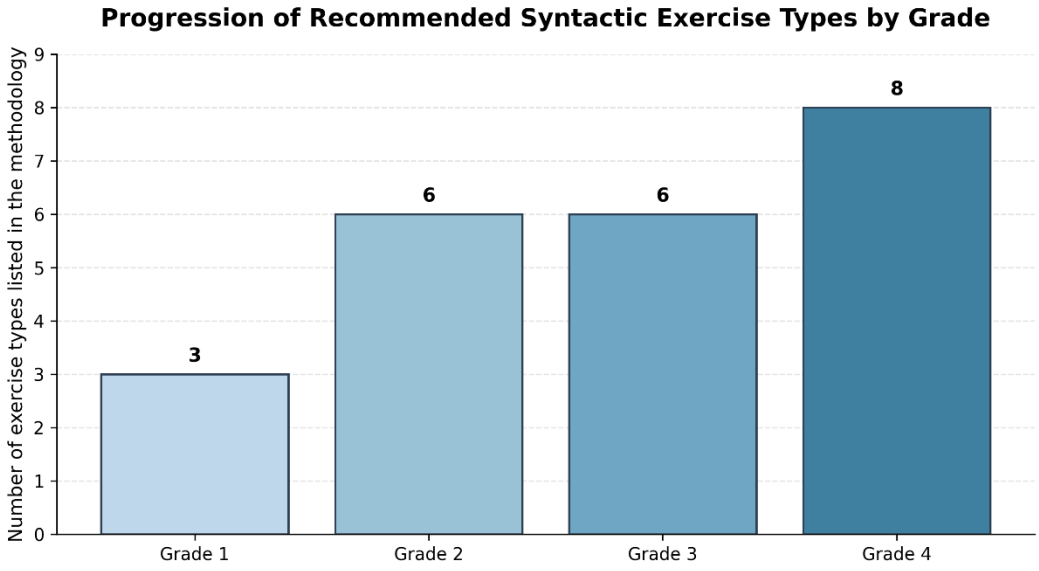
The most important requirement is the unity of language and speech. A syntactic concept should not remain an abstract term. Pupils should see how it operates in speech. For instance, a declarative sentence is not simply a sentence with a period; it is a grammatical form used to report information. A question sentence is not only a structure that ends with a question mark; it is a

communicative tool for requesting information. Similarly, punctuation marks should be taught in connection with sentence boundaries, intonation, and meaning.

Another major requirement is the integration of morphology and syntax. Pupils should learn that word classes and sentence functions are related but not identical. A noun may be a subject in one sentence and a secondary part in another. A verb often carries the predicate function, but pupils need guided exercises to understand how the verb completes the idea of the sentence. This kind of integrated explanation prevents mechanical memorization and supports conscious grammar learning.

3.2. Grade-wise progression of syntactic exercises

The exercise sequence becomes gradually more complex from Grade 1 to Grade 4. In Grade 1, the emphasis is on answering questions, making simple sentences from pictures, and constructing sentences from given words. In Grade 2, pupils begin to create dialogues, construct word combinations and sentences, use words denoting objects, persons, places, attributes, and actions, compose short oral texts from pictures, restore missing punctuation, and reconstruct deformed texts. In Grade 3, the focus expands to making sentences from keywords, observing sentence construction and word connections, identifying the grammatical basis of a sentence, explaining punctuation, drawing schemes of word relations, and creating oral stories. In Grade 4, pupils perform more analytical and creative tasks: they construct word combinations and sentences from keywords, identify the grammatical basis, explain punctuation functions, analyze word combinations and sentences, distinguish parts of speech and syntactic functions, complete sentences with missing words, transform sentence types according to communicative purpose, and create didactic materials or creative stories from keywords.



Note. Counts summarize the grade-wise exercise types described in the source article; they are not classroom frequency data.

Chart 1. Progression of recommended syntactic exercise types by grade

Chart 1 summarizes the grade-wise scope of exercise types in the proposed methodology. The increase from Grade 1 to Grade 4 reflects a shift from basic sentence production toward analysis, transformation, and creative text construction. The chart should be interpreted as a methodological map, not as quantitative classroom observation data.

3.3. Classification of syntactic exercises for primary grades

The following classification translates the grade-wise exercise list into an IMRAD-ready instructional framework.

Grade	Main exercise types	Expected skill emphasis
Grade 1	Answering questions; making sentences from pictures; constructing sentences from given words.	Recognizing complete thought and forming simple sentence boundaries.
Grade 2	Answering questions and making dialogues; creating word combinations and sentences; constructing short oral texts from pictures; restoring missing punctuation; reconstructing deformed texts.	Moving from single sentences to connected expression and basic punctuation awareness.
Grade 3	Constructing sentences from keywords; observing sentence structure and word connections; identifying the grammatical basis; explaining punctuation; drawing schemes of word relations; making oral stories.	Understanding the internal structure of the sentence and the relation between words.
Grade 4	Constructing and analyzing word combinations and sentences; identifying parts of speech and syntactic functions; completing sentences; transforming sentence types; creating didactic material and creative stories.	Applying syntactic knowledge independently in analysis, transformation, and creative speech production.

3.4. Systemic-pragmatic model of syntactic exercise organization

The model below presents syntactic exercises as an integrated system. It begins with the learning aim and task, moves through didactic and methodological requirements, organizes materials and exercise actions, defines the teacher's facilitative role, and ends with measurable learning outcomes. The model is called systemic because all components are connected; it is pragmatic because the final aim is pupils' meaningful use of syntactic structures in speech.

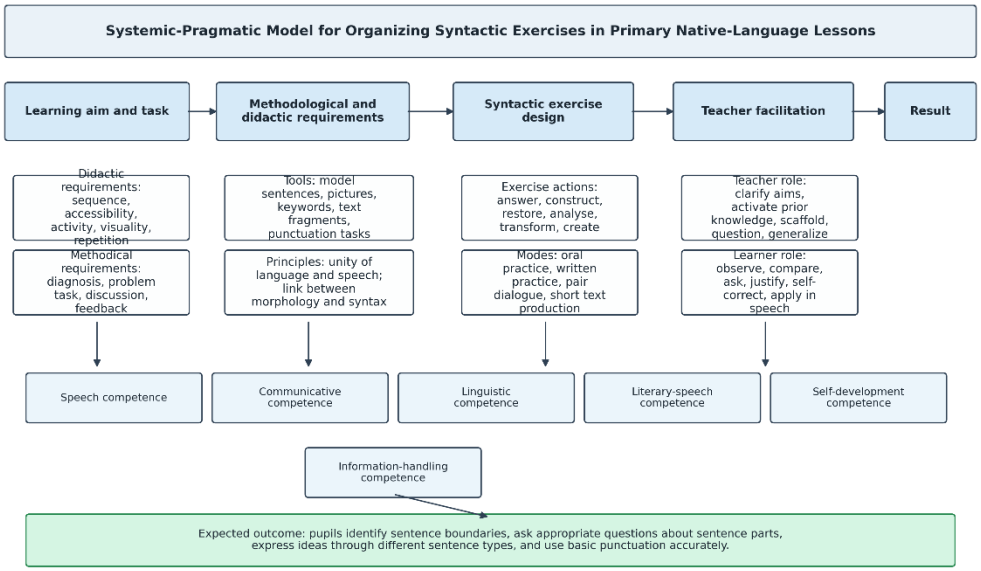


Figure 1. Systemic-pragmatic model for organizing syntactic exercises in primary native-language lessons

3.5. Expected learning outcomes

When the exercise system is applied consistently, pupils are expected to demonstrate the following outcomes:

- They can identify the beginning and ending of a sentence and distinguish a sentence from an incomplete word sequence.
- They can ask appropriate questions about sentence parts and understand how words are connected grammatically.
- They can express one idea through different syntactic constructions, including declarative, interrogative, exclamatory, and imperative sentences.
- They can use basic punctuation marks such as the period, question mark, and exclamation mark in written speech.
- They can connect syntactic analysis with meaningful oral and written expression rather than treating grammar as memorized terminology.
- They can use syntactic knowledge to support coherent short texts, dialogues, and creative stories.

4. Discussion

4.1. Why syntactic exercises require systematic organization

The results confirm that syntactic exercises play a broader role than simple grammar practice. They help pupils transform language knowledge into speech ability. Without a systematic sequence, pupils may learn to name grammatical concepts but remain unable to apply them when speaking or writing. A well-designed syntactic exercise system prevents this gap because it requires pupils to move from recognition to production, from production to analysis, and from analysis to creative use.

The progression from Grade 1 to Grade 4 is especially important. Younger pupils need concrete and visual tasks: pictures, questions, and given words. These tasks help them understand that a sentence expresses a complete thought. As pupils grow older, the tasks should require greater independence: restoring punctuation, explaining why a punctuation mark is needed, identifying the grammatical basis, drawing word-connection schemes, and transforming sentence types. By Grade

4, pupils should not only analyze sentences but also use syntactic knowledge to improve their own speech and writing.

4.2. Integration of morphology and syntax

A central pedagogical implication is that syntax should be taught together with morphology. In primary grades, pupils often learn parts of speech earlier than they fully understand sentence structure. If the teacher presents morphology and syntax separately, pupils may confuse the two. For example, they may answer “noun” when asked about the subject, or “verb” when asked about the predicate. The teacher should therefore guide pupils to see that morphology describes what kind of word a unit is, while syntax describes what function that word performs in a sentence. Exercises should ask both questions: What part of speech is this word? What does it do in this sentence?

This integrated approach makes grammar more meaningful. It shows pupils that word classes become useful when they help build a complete sentence. It also supports spelling and punctuation, because pupils begin to see punctuation not as an arbitrary mark but as a signal of sentence structure, intonation, and communicative purpose.

4.3. Competence-based value of syntactic exercises

The proposed model aligns with competence-based education. Speech competence is developed when pupils formulate complete oral and written statements. Communicative competence is developed when pupils select a sentence type according to purpose: to inform, ask, request, command, or express emotion. Linguistic competence is developed when pupils recognize sentence parts and word relations. Self-development competence is strengthened when pupils learn to check and correct their own sentences. Information-handling competence is supported when pupils read, interpret, and reconstruct written material. Literary-speech competence is supported when pupils use sentences to compose short stories and expressive texts.

Thus, syntactic exercises should be evaluated not only by whether pupils can complete a worksheet but also by whether they can use sentence structures in meaningful contexts. A pupil who can identify the grammatical basis of a sentence but cannot write a coherent sentence has not fully achieved the communicative aim of syntax teaching. Conversely, a pupil who can write a sentence but cannot explain its structure may need more explicit grammar support. Effective teaching balances both dimensions.

4.4. Practical recommendations for teachers

- Begin each syntactic lesson with a communicative situation, picture, short text, or problem sentence so that pupils understand why the structure is needed.
- Ask pupils to construct sentences before giving formal definitions; after practice, help them generalize the rule.
- Connect every syntactic task with a morphological question, for example: “What part of speech is this word?” and “What role does it perform in the sentence?”
- Use oral and written practice together. A sentence should be spoken, heard, written, read, and analyzed.
- Use short formative feedback: point out the success, name the error, and ask the pupil to correct it through a guiding question.
- Gradually reduce teacher support so that pupils move from imitation to independent sentence construction and text production.

4.5. Limitations and future direction

Because this article is methodological, it does not provide experimental evidence showing the effect of the proposed model on pupils' achievement. Future research may test the model in several primary classrooms by comparing pupils' syntactic awareness, punctuation accuracy, sentence construction, and short-text writing before and after a structured intervention. Classroom observation may also be used to examine how teachers scaffold pupils' transition from morphological identification to syntactic analysis. Such empirical work would strengthen the evidence base for the proposed methodological requirements.

5. Conclusion

Syntactic concepts occupy a central place in primary native-language education because they help pupils use language as a means of complete and meaningful expression. The organization of syntactic exercises should therefore be systematic, continuous, age-appropriate, and communicatively oriented. The article has shown that exercise types should progress from simple question-answer and picture-based sentence construction in Grade 1 to analysis, punctuation explanation, transformation, and creative text production in Grade 4. It has also argued that the connection between morphology and syntax is a key methodological requirement: pupils should learn both what kind of word a unit is and what function it performs in a sentence. The proposed systemic-pragmatic model gives teachers a practical framework for clarifying objectives, diagnosing prior knowledge, selecting exercises, organizing learner activity, supporting discussion, and providing feedback. When applied consistently, this model can help pupils identify sentence boundaries, ask questions about sentence parts, use punctuation correctly, and express their thoughts through different syntactic constructions. In this way, syntactic exercises become not only a grammar-learning tool but also a foundation for speech development, communicative competence, linguistic awareness, and independent learning.

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PRINCIPLES OF A METHODOLOGY FOR DEVELOPING HISTORICAL ANALYSIS SKILLS AMONG ACADEMIC LYCEUM STUDENTS BASED ON UNIVERSAL HUMAN VALUES

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Abstract. *This article examines the methodological principles for developing historical analysis skills among academic lyceum students on the basis of universal human values. The study is designed as a conceptual and pedagogical analysis of how historical objectivity, values integration, and critical thinking can be organized in history education to strengthen learners' historical thinking, analytical reasoning, and moral judgment. The article argues that historical analysis should not be limited to the memorization of events, dates, and personalities. Instead, students should learn to compare sources, evaluate evidence, recognize the complexity of historical processes, and draw balanced conclusions from the perspective of justice, humanism, tolerance, peace, and respect for human dignity. The methodological framework combines the historical-analytical method, comparative approach, pedagogical observation, and case-study work. These methods help students interpret historical events in relation to both national heritage and universal ethical norms. The proposed framework supports the formation of independent, socially active, and morally responsible learners who are able to evaluate historical phenomena objectively and apply value-based reasoning in contemporary civic life.*

Keywords: *historical analysis skills, historical objectivity, values integration, critical thinking, historical thinking, comparative approach, case study, pedagogical observation, universal human values, moral development.*

Introduction

Historical education plays an important role in shaping students' intellectual, civic, and moral development. For academic lyceum students, history lessons are not only a source of knowledge about the past but also a means of learning how to interpret evidence, compare viewpoints, and make reasoned judgments about human actions and social change. When history is taught through universal human values, students are encouraged to understand the past in relation to justice, human dignity, tolerance, peace, responsibility, and respect for cultural diversity. Such an approach makes historical analysis both cognitive and ethical.

The development of historical analysis skills requires more than factual recall. Students must be able to distinguish reliable evidence from unsupported claims, examine the intentions and perspectives of historical actors, compare historical events across periods and civilizations, and avoid one-sided interpretations. These skills are especially important in academic lyceums, where learners are expected to demonstrate higher levels of independent thinking and readiness for advanced study. A values-based methodology helps students connect historical knowledge with broader human concerns and prevents history from being reduced to a narrow or purely national narrative.

The pedagogical literature on values education emphasizes the importance of forming students' value systems, moral consciousness, and social responsibility (Nurbayeva, 2022; Taylanova, 2012; Xajiyeva, 2025). In the context of history teaching, these aims become meaningful when learners are guided to analyze historical events objectively and evaluate them through humanistic criteria. This article therefore focuses on the principles and methods that can support the formation of historical analysis skills among academic lyceum students on the basis of universal human values.

The purpose of the article is to systematize the main methodological principles of values-based historical analysis and to show how these principles can be implemented through historical-analytical, comparative, observational, and case-study methods. The article addresses the following question: How can universal human values be integrated into history teaching in order to develop students' historical objectivity, critical reasoning, and independent conclusions?

Materials and Methods

The article uses a conceptual-methodological research design. Rather than reporting an experimental intervention or statistical measurement, it synthesizes pedagogical principles and instructional methods that are relevant to the development of historical analysis skills in academic lyceum education. The main object of analysis is the teaching process through which students learn to examine historical events, sources, and personalities from the standpoint of universal human values.

The methodological basis consists of four interrelated approaches. First, the historical-analytical method is used to examine events, personalities, and social processes in depth. This method requires students to identify causes, consequences, motives, and the human impact of historical decisions. Second, the comparative approach is used to compare different periods, regions, societies, or civilizations according to shared ethical criteria such as justice, humanism, cooperation, peace, and respect. Third, pedagogical observation is used as a formative assessment tool that allows teachers to monitor students' reasoning, participation, and ability to support conclusions with evidence. Fourth, the case-study method is used to present students with historical situations related to concepts such as human rights, injustice, tolerance, and peace.

The analytical procedure followed three steps. In the first step, the key principles in the source article were translated and consolidated into an English-language academic framework. In the second step, repeated multilingual sections were removed, and the article was reorganized into Introduction, Materials and Methods, Results, and Discussion sections. In the third step, the main principles and methods were mapped into a table and a conceptual chart so that the pedagogical logic of the framework could be visually represented. The chart is not an empirical measurement of student performance; it is a conceptual synthesis showing how many framework components directly support each targeted learning outcome.

Results

The conceptual analysis produced a values-based framework built around three core principles and three instructional-methodological tools. The principles are historical objectivity, integration of national and universal values, and critical thinking. The tools are historical-analytical study, comparative analysis, and observation-supported case-study work. Together, these elements create a methodology in which students learn to interpret historical knowledge through evidence, ethical reasoning, and independent judgment.

Historical Objectivity

different interpretations while still reaching an informed conclusion.

Table 1. Values-Based Methodological Framework for Developing Historical Analysis Skills

Principle or method	Main pedagogical focus	Classroom implementation	Expected student outcome	Assessment evidence
Historical objectivity	Evidence-based and fair interpretation	Compare sources, distinguish fact from opinion, avoid one-sided judgments	Balanced historical conclusions	Student explanations cite evidence and acknowledge complexity
Values integration	Connection between national heritage and universal ethics	Discuss events through justice, humanism, tolerance, and dignity	Moral and civic interpretation of history	Student arguments link historical facts with ethical criteria
Critical thinking	Independent evaluation of information	Analyze author perspective, reliability, purpose, and context	Reasoned judgment and independent thinking	Student identifies bias, missing evidence, and alternative interpretations
Historical-analytical method	Deep analysis of events and personalities	Examine causes, consequences, motives, and human impact	Structured historical reasoning	Student explains relationships among causes, actions, and consequences
Comparative approach	Cross-period and cross-cultural comparison	Compare civilizations, periods, and decisions using shared value criteria	Broader historical worldview	Student identifies similarities, differences, and value-based patterns
Observation and case study	Applied analysis of historical situations	Use cases on human rights, injustice, peace, and social responsibility	Practical application of historical thinking	Teacher observes participation, argument quality, and conclusion formation

Note. The framework synthesizes the translated source article into APA-style academic presentation. The elements are conceptual and instructional rather than experimental variables.

Historical objectivity is the first and most important principle of the proposed methodology. It means that historical events and personalities should be evaluated truthfully, fairly, and on the basis of reliable evidence. Students should not interpret history only through

narrow personal, emotional, or one-sided perspectives. Instead, they should compare sources, examine different viewpoints, and avoid conclusions that are not supported by evidence.

In classroom practice, historical objectivity can be developed by requiring students to ask several analytical questions: What evidence supports this interpretation? Which sources agree or disagree? What perspectives may be absent? What social and ethical consequences followed from this event? Such questions help learners understand that historical processes are complex and often contain competing explanations. As a result, students become more capable of forming balanced conclusions and more aware of the responsibility involved in judging the past.

Integration of National and Universal Values

Values integration means examining national heritage in harmony with universal moral principles. National traditions, customs, and cultural memory should not be separated from values recognized by humanity as a whole, such as justice, honesty, tolerance, compassion, human dignity, and peace. In history lessons, this principle helps students appreciate their national identity while also understanding the wider human meaning of historical events.

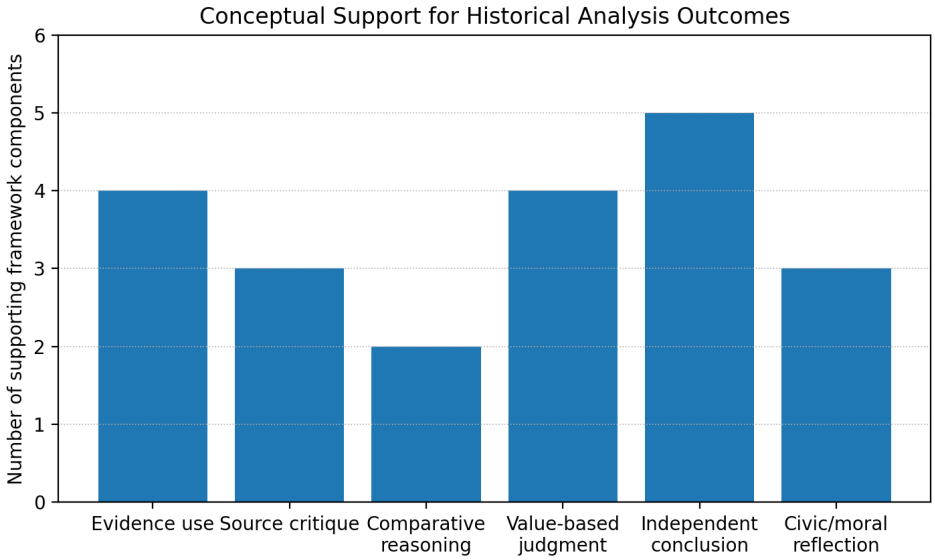
The integration of values is pedagogically important because it develops broad worldview, intercultural respect, and moral awareness. When students study a historical event, they should be encouraged to identify both its national context and its universal ethical dimension. For example, the study of rulers, reforms, conflicts, or cultural achievements can include discussion of whether the actions involved promoted justice, protected human dignity, or caused suffering. This approach deepens historical understanding and connects historical analysis with moral development.

Critical Thinking and Source Evaluation

Critical thinking is the third core principle. It requires students not simply to receive information but to analyze, compare, question, and evaluate it. In relation to historical sources, critical thinking includes examination of the content of a source, the reliability of the information, the possible intention of the author, and the social or ideological context in which the source was produced.

Through critical thinking, students learn to view historical events from multiple perspectives. They also learn to evaluate historical personalities according to evidence and universal values, including justice, human rights, tolerance, and social equality. This process develops the ability to make independent decisions, support arguments with evidence, and respect

Figure 1. Conceptual Support for Targeted Historical Analysis Outcomes



Note. Counts indicate the number of framework components in Table 1 that directly support each outcome. The chart is a conceptual mapping, not a statistical result.

Figure 2. Integrated Model of Values-Based Historical Analysis



Note. The model represents the instructional logic of the translated article: universal values guide principles, principles guide historical tasks, and tasks develop analytical and civic-moral outcomes.

Discussion

The framework shows that historical analysis skills can be strengthened when history teaching combines evidence-based reasoning with universal human values. Historical objectivity protects students from emotional or one-sided interpretations. Values integration prevents national history from being isolated from wider human concerns. Critical thinking enables learners to evaluate sources, compare interpretations, and defend conclusions through evidence. These principles are mutually reinforcing rather than separate.

The historical-analytical method is especially useful because it asks students to move beyond description. When students examine the motives, actions, and consequences of historical figures, they learn to connect individual decisions with broader social outcomes. A humanistic perspective also helps them recognize that history is not only a sequence of events but a record of human choices, suffering, achievements, conflicts, and moral responsibilities.

The comparative approach adds a broader interpretive dimension. By comparing different periods, regions, and civilizations, students learn that societies may differ in culture and political structure while still being evaluated through shared human concerns. This type of comparison develops historical thinking, intercultural understanding, and respect for diversity. It also encourages students to see universal values not as abstract slogans but as practical criteria for interpreting human experience.

Pedagogical observation and case-study work are important because they make assessment more authentic. A teacher can observe whether students merely repeat information or whether they can analyze a historical situation, support a claim with evidence, consider ethical consequences, and reach an objective conclusion. Case studies involving human rights, injustice, peace, and tolerance allow students to apply values-based historical reasoning to concrete situations. In this way, assessment becomes part of learning rather than a separate final check.

The main limitation of the present article is that it is conceptual and methodological. It does not report empirical data from a classroom intervention, and therefore it cannot claim measured improvement in student skills. Future studies may test the framework through lesson observations, pre- and post-tests of historical analysis, rubric-based assessment, or comparative classroom research. Nevertheless, the proposed framework offers a structured basis for designing lessons, tasks, rubrics, and methodological materials for academic lyceum history education.

Conclusion

Developing historical analysis skills among academic lyceum students requires a methodology that joins cognitive, ethical, and civic aims. On the basis of universal human values, history lessons can teach students to evaluate evidence objectively, compare perspectives, interpret historical events through humanistic criteria, and draw independent conclusions. The principles of historical objectivity, values integration, and critical thinking are central to this process.

The proposed methodology shows that historical education should contribute not only to knowledge acquisition but also to the formation of independent, socially active, and morally mature individuals. Through historical-analytical study, comparative work, pedagogical observation, and case-study tasks, students can learn to understand the past deeply and apply its lessons responsibly in contemporary society. Therefore, integrating national and universal values into history teaching is a necessary condition for developing both historical thinking and spiritual-moral maturity.

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METHODOLOGICAL FOUNDATIONS FOR DEVELOPING STUDENTS' SPEECH THROUGH THE INTEGRATION OF NATIVE LANGUAGE AND READING LITERACY SUBJECTS IN PRIMARY GRADES

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Abstract. *This article highlights the didactic and methodological possibilities for developing students' speech competencies through the integration of native language and reading literacy subjects in primary education. It substantiates the importance of interdisciplinary continuity in fostering skills such as sound-letter analysis, syllabification, word structure analysis, sentence construction, and orthographic literacy. Furthermore, the article analyzes methods for developing oral and written speech through practical exercises, explanatory techniques, and supplementary assignments used during lessons. Research findings indicate that an integrated approach serves as an effective tool for developing the language competence, independent thinking, and literacy of primary school students.*

Keywords: *primary education, interdisciplinary integration, native language, reading literacy, speech development, sound and letter, syllable, word structure, orthographic literacy, didactic tasks, methodological approach, competence.*

The formation of certain qualities of an individual and the development of existing knowledge, skills, and abilities require interdisciplinary continuity, which is of great importance. Lexically, the concept of **"continuity"** expresses the meanings of **"closely connected", "interrelated"** and **"inseparable"** [9]. In primary grades, all subjects taught at this stage of the continuous education system are equally important in familiarizing students with the surrounding environment, increasing their literacy level, and developing their speech. Therefore, relying on the didactic opportunities of subjects such as **"Alphabet", "Reading literacy", "Native language", "Mathematics" "Natural science"** and others during lessons serves the comprehensive development of students [8].

From the perspective of the knowledge, skills, and competencies acquired by students within a school subject, the characteristics of Reading Literacy and Native Language education are closely interconnected. This, in turn, means that it is possible to appropriately and effectively use the didactic opportunities of the **Native Language** subject in Reading literacy lessons and the **Reading literacy** subject in Native Language lessons. Indeed, **"the development of students' speech at school is regarded as the primary task of teaching the native language"** [10].

In enriching the educational content related to speech development through text-based activities in primary grades, the teacher is expected to provide tasks concerning the expressive language means found in texts alongside special speech exercises. This creates the opportunity to achieve the expected learning outcomes [7].

The results of pedagogical observations showed that some students experience difficulties in correctly pronouncing short and long sounds and in distinguishing vowels from consonants. The

reason for this is insufficient work on sound-letter analysis during lessons and the failure to use various auditory and practical exercises during the literacy teaching period. When moving to the "**Grammar and Orthography"** section, the teacher should systematically work to eliminate these shortcomings [4].

During the explanation of such topics as "Vowel and consonant sounds and letters" and "Consonants that differ in pronunciation and spelling" spelling rules cannot be taught separately from pronunciation because they are connected with the sound system of the language. For example, in order to write vowels that are pronounced either short or long depending on the context, students must first hear and distinguish these sounds [3]. To strengthen the skill of identifying consonants that differ in pronunciation and spelling, from the very first lesson students should be taught to analyze words correctly and distinguish vowels and consonants that are pronounced briefly [5]. Along with the exercises provided in the textbook, the following additional tasks may also be used for this purpose:

1. Copy from the dictionary three or four words in which the number of vowels and consonants is equal, and three or four words in which the number of consonants is greater than the number of vowels.
2. Write examples of words containing many vowels (or many consonants).
3. Listen to and write the words "ishchan, bong, qizcha, qaychi, chang" then read the words aloud.
4. Read the following word pairs: "bog‘- tog‘, paxta - taxta, tovus - tovuq, chol - choy". Show the difference between them and independently give similar examples.
5. State the number of vowel and consonant sounds and letters in the exercise.

Example: *kitob* – 2 vowels, 3 consonants; 5 sounds, 5 letters.

While completing these tasks, it is advisable to use the commentary (explanatory) method. At first, the tasks are performed under the teacher's guidance, and later independently by the students. Particular attention is paid to developing students' ability to identify correctly the number of vowel and consonant sounds and letters in a word without making mistakes [2].

Already in the first year of primary education, students learn to divide words into syllables. The skill of syllabification is formed in Alphabet lessons through listening-based exercises.

Students' successful mastery of the topic "Vowel and consonant sounds and letters" creates the foundation for their successful understanding of such topics as "Syllable" and "Sentence".

To ensure students thoroughly master the topics "Syllable" and "Sentence", the following additional tasks are recommended alongside the textbook exercises:

1. Copy two two-syllable words and two three-syllable words from the dictionary and justify that the task has been completed correctly.
2. Read the following words: o‘qituvchi (teacher), o‘quvchi (student), aqlli (intelligent). First divide them into syllables, then copy them, recalling the rules necessary for completing the task correctly.
3. Read the following words: odob (good manners), maktab (school), non (bread), ona (mother). Identify the words that cannot be divided when transferred to the next line and explain why they cannot be transferred by syllables.
4. State the number of syllables, vowels, and consonants in the given words. Example: *maktab* – 2 syllables, 2 vowels, 4 consonants, 6 sounds, 6 letters.

5. Using the given words, first make a sentence orally and then write it down: aka (older brother), maktab (school), o‘qimoq (to study). Example: *Akam maktabda o‘qiydi.* (My elder brother studies at school.)

By completing such exercises, students come to the conclusion that sentences are made up of words, words are made up of syllables and syllables are made up of sounds. They also learn that sounds are represented by letters in writing and that if the spelling of a word differs from its pronunciation, the correct spelling of vowels or consonants can be determined by applying spelling rules. If students' oral speech is well developed and they pronounce all sounds and words correctly, then naturally their written speech will also be fluent and understandable.

There are broad opportunities for developing students’ speech while working practically with word structure. For example, the teacher gives several pairs of words: uy – uycha (house – little house), ko'ylak – ko'ylakcha (dress – little dress), qo'zi – qo'zichoq (lamb – little lamb). Then the teacher asks the students:

“Since the meanings of these word pairs are similar, can they always be used interchangeably in our speech?”

Without waiting for the students' answer, the teacher provides examples to prevent possible mistakes:

Kattakon uycha qurdik. *(We built a very big little house.)* Karim kichkina ko'ylakchasini kiydi**.** *(Karim put on his little small dress.)*

Together with the students, the teacher explains that it is incorrect to say “kattakon uycha” (very big little house), whereas “kichkina ko'ylakcha” (small little dress) is acceptable.

The teacher then gives another example by writing the following sentence on the board in advance and asking students to choose the appropriate word from those given in parentheses:

Oz-oz o'rganib ... bo'lur. (yaxshi, dono)

Little by little learning makes one become ... (good, wise).

Such comparison draws students’ attention to the fact that even a small additional task can give purely grammatical work not only a speech-development orientation but also an educational value. Paying attention to words and fostering interest in using them correctly develops respect for the native language.

As the President of the Republic of Uzbekistan, Sh. M. Mirziyoyev, emphasized: “When we think about the destiny and future of our people, we must first preserve, as the apple of our eye, the genuine virtues of our nation, our beautiful traditions, our unique art and literature, and our native language. In short, each of us should regard attention to the state language as attention to independence, and respect and loyalty to the state language as respect and loyalty to our Motherland, making this principle a rule of our lives.” [1]

At the subsequent stages, in order to strengthen students’ ability to identify the stem of a word, the teacher presents the following sentence for analysis:

Bog'imizdagi gullar gulladi. The flowers in our garden flowered.

The teacher explains that there is a mistake in the sentence and asks students to find it, explain its cause, and identify the word responsible for the mistake. Then the repeated words are identified and the error is corrected:

gulladi → ochildi, flowered → bloomed/opened

From this analysis, the following conclusions are drawn:

1. Using words with the same stem next to each other or very close together leads to a speech error.

2. To avoid such errors in speech, one should be attentive when choosing words.

Exercises of this type not only develop students' speech but also form their ability to identify the stem (root) of a word.

In conclusion, the integration of the Native language and Reading literacy subjects in primary education is an important factor in developing students' oral and written speech, strengthening their orthographic literacy, and ensuring the conscious acquisition of language phenomena. Systematic exercises related to sound-letter analysis, syllable work, word structure, and sentence construction help students develop solid knowledge, skills, and competencies. The use of methodological approaches based on interdisciplinary continuity in classroom instruction contributes to improving the effectiveness of education, developing students' communicative competence and fostering respect and appreciation for the state language. Therefore, the effective use of integrated didactic tasks and modern pedagogical methods in designing Native Language and Reading Literacy lessons for primary grades is considered one of the important methodological directions.

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DEVELOPING ALGORITHMIC THINKING AMONG 5TH–6TH GRADE STUDENTS THROUGH DIGITAL LEARNING PLATFORMS IN PROGRAMMING EDUCATION

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Abstract. *The integration of digital technologies into school education has created new opportunities for developing students' higher-order cognitive and problem-solving skills. Programming education is particularly relevant in this context because learning to program requires students to formulate problems, decompose them into manageable components, organize sequences of actions, apply conditional and iterative structures, test solutions, and identify and correct errors. This study examines the pedagogical potential of digital learning platforms for developing algorithmic thinking among 5th–6th grade students in programming education.*

The study addresses a gap in existing research related to the systematic development and assessment of specific components of algorithmic thinking among lower-secondary students. Although previous studies have demonstrated the potential of programming, block-based environments, and digital learning tools for supporting computational thinking, comparatively less attention has been given to algorithmic thinking as a distinct and measurable educational outcome. To address this gap, the study proposes a quasi-experimental pretest–posttest control-group design comparing digital-platform-based programming instruction with traditional programming instruction.

Algorithmic thinking is conceptualized through six interrelated components: sequencing, decomposition, conditional reasoning, iterative reasoning, debugging, and algorithm construction. A component-based assessment framework is proposed, with each dimension evaluated using practical tasks and a four-level rubric. The digital instructional model follows a structured cycle of problem identification, decomposition, algorithm design, programming, testing, debugging, and reflection. The study is expected to provide evidence concerning the effectiveness of digital learning platforms in developing algorithmic thinking and to identify the components most responsive to platform-supported instruction. The proposed framework may contribute to the development of evidence-based digital didactic resources, programming curricula, and assessment tools for computer science education at the 5th–6th grade level.

Keywords: *algorithmic thinking; programming education; digital learning platforms; computational thinking; Scratch; programming literacy; debugging; block-based programming; 5th–6th grade students; digital didactic resources.*

1. Introduction

The rapid development of digital technologies is reshaping the objectives and practices of contemporary education. Modern educational systems are increasingly expected to develop not only students' subject knowledge but also their ability to analyze unfamiliar problems, formulate

solutions, reason logically, and use digital technologies effectively. Within this transformation, computer science education has become an important context for cultivating higher-order cognitive skills and preparing learners for increasingly digitalized academic and professional environments.

Programming education is particularly significant because programming involves a sequence of cognitive processes that extend beyond learning programming syntax. To develop a functional program, students must first understand the problem, identify its essential elements, determine an appropriate sequence of actions, recognize conditions and repetitive structures, implement a solution, test the result, and revise errors. Consequently, programming can be considered an important educational context for developing structured and algorithmic forms of reasoning.

The development of computational thinking through programming has received considerable attention in educational research. Systematic reviews have reported the potential of Scratch and other programming environments to support computational thinking development among school-aged learners (Fagerlund et al., 2021; Montiel & Gomez-Zermeño, 2021; Zhang & Nouri, 2019). Meta-analytic evidence has also indicated that the design of programming activities can influence the effectiveness of computational thinking interventions (Sun et al., 2021). More recent research has continued to explore programming, game-based learning, and project-based approaches as mechanisms for strengthening computational thinking competencies (Cafarella & Vasconcelos, 2025; Pan et al., 2024; Zhang et al., 2024).

However, computational thinking is a broad construct that incorporates multiple dimensions. When it is measured only as an overall competency, it may be difficult to determine how individual algorithmic skills develop through programming instruction. Algorithmic reasoning involves more specific processes, including sequencing, decomposition, conditional reasoning, iteration, debugging, and the construction of algorithmic solutions. Research specifically examining these dimensions among 5th–6th grade students remains comparatively limited.

The educational stage represented by grades 5–6 is particularly important. At this age, students increasingly develop logical, abstract, and structured reasoning skills. Systematic exposure to programming can therefore provide an important foundation for more advanced computer science learning. Studies of computational thinking assessment have demonstrated the feasibility of measuring programming-related cognitive competencies among students in this age range (El-Hamamsy et al., 2023; Tsai et al., 2022).

Traditional programming instruction commonly relies on teacher explanations, textbooks, demonstrations, written exercises, and reproduction of previously prepared examples. Such approaches can effectively communicate basic concepts, but they may provide fewer opportunities for students to engage in repeated cycles of independent construction, immediate testing, error identification, and revision.

Digital learning platforms offer an alternative environment in which learning can become more interactive, individualized, and practice-oriented. In a digital environment, learners can construct a program, execute it, observe its behavior, identify discrepancies, modify the solution, and repeat the process. Such iterative learning experiences may be particularly valuable for developing debugging and algorithm-construction skills.

Block-based programming environments provide an additional pedagogical advantage for novice programmers by reducing the syntactic complexity of programming. Research comparing

block-based and text-based programming has shown that programming modality can influence students' learning processes and programming practices (Weintrop & Wilensky, 2017, 2018). Scratch, in particular, has been widely investigated as an environment for supporting computational thinking and introductory programming education (Fagerlund et al., 2021; Zhang & Nouri, 2019).

Nevertheless, the educational value of a digital platform should not be determined solely by the presence of technology. The effectiveness of the platform depends on the instructional tasks, feedback mechanisms, progression of complexity, opportunities for debugging, and ways in which learners are encouraged to reflect on their solutions. Therefore, the present study focuses on the pedagogical mechanisms through which digital learning platforms may support the development of algorithmic thinking.

2. Literature Review

2.1. Programming Education and Computational Thinking

Programming education has increasingly been associated with the development of computational thinking. Computational thinking is generally understood as a collection of problem-solving processes involving abstraction, decomposition, algorithmic reasoning, evaluation, and related cognitive practices.

Research conducted with school-aged learners has shown that programming activities can contribute to the development of computational thinking skills. Fagerlund et al. (2021), in their systematic review of Scratch-based programming in primary education, identified programming with Scratch as a promising context for computational thinking development. Similarly, Montiel and Gomez-Zermeño (2021) emphasized the educational potential of Scratch while also highlighting the importance of appropriate pedagogical design.

Meta-analytic evidence further suggests that the effectiveness of programming activities depends on how learning tasks are designed and implemented. Sun et al. (2021) found that the design characteristics of programming activities can influence computational thinking outcomes. This finding is important because it suggests that technological tools alone cannot explain learning gains; rather, instructional design is a critical component of programming education.

More recent studies have investigated game-based and project-based approaches. Pan et al. (2024) examined game-based learning as a means of enhancing computational thinking among middle school students, while Zhang et al. (2024) reported evidence supporting the effectiveness of project-based learning for computational thinking development. These studies indicate that active and problem-oriented learning environments may provide particularly favorable conditions for developing computational competencies.

2.2. Algorithmic Thinking as a Distinct Dimension

Although algorithmic thinking is closely related to computational thinking, it can be considered a more specific construct emphasizing the organization and construction of procedures for solving problems.

Algorithmic thinking involves the ability to represent a problem as a sequence of logical operations, identify relationships among actions, determine conditions, construct repetitive processes, and evaluate and correct algorithmic solutions. In programming education, these skills are not isolated from one another but operate as a coordinated system.

Recent research has increasingly focused on algorithmic thinking specifically. Endo and Kusaka (2024), for example, investigated lessons and assessment approaches for fostering

algorithmic thinking through Scratch. Erkan and Akkaya (2025) also examined coding education practices in relation to primary students' algorithmic thinking skills.

These studies support the relevance of algorithmic thinking as an educational outcome. However, further research is needed to establish comprehensive component-based models that can distinguish different aspects of algorithmic performance among students in grades 5–6.

2.3. Block-Based Programming and Scratch

Block-based programming has become a widely used approach for introducing programming concepts to school-aged learners. The principal advantage of block-based environments is that they reduce the burden associated with syntax while preserving the logical structure of programming.

Weintrop and Wilensky (2017, 2018) demonstrated that programming modality influences novice programming practices and learning processes. By allowing students to manipulate visual blocks, Scratch and similar environments enable learners to focus on program logic rather than syntactic errors.

Scratch has consequently become one of the most extensively studied programming environments in school education. Research has examined its contribution to computational thinking, programming achievement, learner motivation, and problem-solving skills (Fagerlund et al., 2021; Gamito et al., 2022; Montiel & Gomez-Zermeño, 2021; Zhang & Nouri, 2019).

The growing body of research supports the use of block-based programming for introductory programming education. Nevertheless, there remains a need to examine how specific Scratch-based learning activities can be deliberately structured around the development and assessment of algorithmic thinking components.

2.4. Assessment of Computational and Algorithmic Thinking

Assessment represents one of the most important challenges in programming and computational thinking education. A single overall score may not adequately represent the multidimensional nature of students' algorithmic performance.

Several instruments have been developed to assess computational thinking among school-aged learners. El-Hamamsy et al. (2022, 2023) developed and validated the Competent Computational Thinking Test for students in grades 3–6. Tsai et al. (2022) developed the Computational Thinking Test for Elementary School Students, while other research has examined age-appropriate assessment instruments and their psychometric characteristics.

These studies demonstrate the importance of reliable and developmentally appropriate assessment. However, computational thinking assessment does not necessarily provide detailed information about students' ability to sequence actions, decompose problems, apply conditions, construct iterations, debug programs, and independently develop algorithms.

Therefore, a component-based algorithmic thinking assessment framework may provide more diagnostic information for programming instruction.

2.5. Digital Platforms as Didactic Environments

Digital platforms have the potential to transform programming education from a predominantly teacher-directed process into an interactive learning cycle. Their educational value may arise from immediate feedback, task differentiation, progress tracking, interactive exercises, and opportunities for repeated practice.

However, digital technology should not be considered an instructional intervention in isolation. Its impact depends on the pedagogical mechanisms incorporated into the learning environment. Interactive problem solving, staged difficulty, debugging tasks, and project-based

activities may be particularly important for transforming digital functionality into meaningful cognitive development.

This perspective is consistent with broader research emphasizing the importance of instructional design in technology-supported learning. Digital environments may be most effective when they actively engage learners in constructing, testing, evaluating, and revising solutions rather than merely delivering information.

3. Research Gap

The reviewed literature suggests four interconnected gaps.

First, although computational thinking has been extensively investigated, algorithmic thinking is less frequently operationalized as a distinct educational construct, particularly among students in grades 5–6.

Second, many studies focus on the general effectiveness of programming environments rather than identifying the specific didactic mechanisms responsible for the development of particular algorithmic skills.

Third, existing assessment approaches frequently provide aggregate measures of computational thinking. There is a need for diagnostic assessment that distinguishes individual algorithmic components.

Fourth, direct comparisons between digital-platform-based and traditional programming instruction remain important for determining whether observed improvements can be associated with the instructional environment rather than simply with exposure to programming content.

The present study addresses these gaps by proposing a component-based model of algorithmic thinking and a comparative instructional framework for evaluating digital-platform-supported programming education.

4. Purpose and Objectives

The purpose of this study is to determine the effectiveness of digital-learning-platform-supported programming instruction in developing algorithmic thinking among 5th–6th grade students.

The study pursues five objectives:

1. To define the structural components of algorithmic thinking relevant to school programming education;
2. To design a digital-platform-based instructional model for 5th–6th grade programming education;
3. To develop practical and diagnostic assessment tasks for the identified components;
4. To compare digital and traditional programming instruction;
5. To statistically evaluate differences in students' algorithmic thinking development.

5. Research Questions

RQ1. To what extent does digital-learning-platform-based programming instruction improve the overall algorithmic thinking of 5th–6th grade students compared with traditional instruction?

RQ2. Which components of algorithmic thinking demonstrate the greatest improvement following digital-platform-based programming instruction?

RQ3. Does the effectiveness of digital-platform-based programming instruction differ between 5th-grade and 6th-grade students?

6. Research Hypotheses

H1. Students who participate in digital-learning-platform-based programming instruction will demonstrate significantly higher posttest algorithmic thinking scores than students who receive traditional programming instruction.

H2. Digital-platform-based instruction will produce significant improvements in algorithm construction, debugging, conditional reasoning, and iterative reasoning.

H3. The effect of digital-platform-based programming instruction will differ significantly between 5th-grade and 6th-grade students.

7. Conceptual Framework

The present study conceptualizes algorithmic thinking as a multidimensional cognitive ability that enables students to represent problems procedurally and construct, evaluate, and improve algorithmic solutions.

Six components are identified:

1. **Sequencing** – organizing actions in an appropriate logical order;
2. **Decomposition** – dividing complex problems into manageable subproblems;
3. **Conditional reasoning** – using conditional relationships to determine alternative actions;
4. **Iterative reasoning** – recognizing and constructing repetitive processes;
5. **Debugging** – identifying and correcting errors;
6. **Algorithm construction** – independently designing an algorithmic solution.

These components are interconnected. For example, effective algorithm construction depends on appropriate sequencing and decomposition, while debugging requires students to compare intended and actual program behavior.

The framework therefore treats algorithmic thinking as an integrated system rather than a collection of unrelated skills.

8. Didactic Model of Digital-Platform-Based Programming Instruction

The proposed instructional model is structured as a repeated problem-solving cycle.

Stage 1. Problem Identification

Students analyze a real-world or instructional problem and determine the desired outcome.

Stage 2. Decomposition

The problem is divided into smaller tasks that can be solved separately.

Stage 3. Algorithm Design

Students determine the sequence of actions, conditions, and repetitions required to solve the problem.

Stage 4. Programming

The algorithm is implemented using Scratch or another appropriate block-based programming environment.

Stage 5. Testing

Students execute the program and compare its behavior with the expected outcome.

Stage 6. Debugging

Students locate and correct errors in the algorithm or program.

Stage 7. Reflection and Refinement

Students evaluate the solution and consider how it can be improved or simplified.

The learning cycle can be represented as:

Problem → Decomposition → Algorithm Design → Programming → Testing → Debugging → Reflection

The model is designed to ensure that students repeatedly engage in algorithmic reasoning rather than simply reproduce predefined programs.

9. Methodology

9.1. Research Design

A quasi-experimental pretest–posttest control-group design is proposed.

Two instructional conditions are compared:

Group	Instructional condition
Experimental group	Programming instruction using a digital learning platform
Control group	Traditional programming instruction

The two groups should receive equivalent curricular content, learning objectives, and, where feasible, comparable instructional time. The principal difference concerns the organization and delivery of programming activities.

The pretest provides a baseline measure of algorithmic thinking, while the posttest is used to examine changes following the instructional intervention.

9.2. Instructional Content

The experimental intervention is organized into five stages.

Stage 1: Algorithmic Foundations

- concept of an algorithm;
- properties of algorithms;
- linear algorithms;
- flowcharts;
- sequences of actions.

Stage 2: Visual Programming

- Scratch environment;
- sprites and stage;
- motion;
- appearance and sound;
- events.

Stage 3: Algorithmic Control

- conditional structures;
- loops;
- variables;
- logical operations.

Stage 4: Algorithmic Problem Solving

- decomposition;
- algorithm construction;
- error identification;
- debugging;
- algorithm refinement.

Stage 5: Project-Based Programming

Students develop small projects such as interactive stories, animations, mini-games, mathematical applications, quizzes, and educational programs.

10. Assessment Framework

Algorithmic thinking is assessed through six components.

Component	Assessment focus
Sequencing	Logical ordering of actions
Decomposition	Division of a complex problem into subtasks
Conditional reasoning	Appropriate use of conditional logic
Iterative reasoning	Construction and recognition of repetitive processes
Debugging	Identification and correction of errors
Algorithm construction	Independent development of a solution

Each component is assessed on a 0–3 scale:

0 – Not developed: The student cannot complete the task or provides an inappropriate solution.

1 – Emerging: The student demonstrates partial understanding and requires substantial assistance.

2 – Developing: The student completes most of the task but makes some errors.

3 – Proficient: The student independently produces a correct and logically appropriate solution.

The maximum score is **18 points**.

11. Assessment Tasks

To capture algorithmic thinking as a practical competence, assessment combines diagnostic and performance-based tasks.

Sequencing. Students arrange a set of scrambled algorithmic actions into the correct order.

Decomposition. Students divide a complex programming problem into smaller and logically connected tasks.

Conditional Reasoning. Students construct an algorithm that produces different outcomes depending on a condition.

Iterative Reasoning. Students design a repetitive algorithm, such as instructing an object to perform a specific action ten times.

Debugging. Students analyze an intentionally incorrect program, identify the source of the error, and correct it.

Algorithm Construction. Students independently develop and implement an algorithm for a problem for which no ready-made solution is provided.

12. Data Collection and Analysis

The study is designed to collect data from multiple sources:

- pretest scores;
- posttest scores;
- component-level assessment scores;
- performance on practical programming tasks;
- platform-based task-completion indicators;
- debugging performance;
- student project outcomes.

The use of multiple sources is intended to provide a more comprehensive representation of students' algorithmic development.

For the quantitative analysis, descriptive statistics should first be calculated for each group and each algorithmic thinking component. Pretest and posttest scores can then be compared within and between groups. Depending on the distribution of the data and the final sample characteristics, appropriate inferential procedures may include analysis of covariance, repeated-measures analysis, or equivalent non-parametric procedures.

Effect sizes should also be reported alongside statistical significance in order to estimate the practical magnitude of differences between instructional conditions.

Importantly, the statistical procedures should be selected after examination of the actual dataset and relevant assumptions rather than predetermined solely on the basis of the proposed research design.

13. Expected Results

Because the empirical intervention has not yet been completed, the present article does not report fabricated statistical findings. Instead, it formulates theoretically grounded expectations that can subsequently be tested empirically.

It is anticipated that students using the digital learning platform will demonstrate greater improvement in algorithmic thinking than students receiving traditional instruction. The expected advantage is particularly relevant to skills that depend on repeated cycles of construction, execution, evaluation, and revision.

Debugging may represent one of the components most strongly influenced by the digital environment because students can immediately observe program behavior, identify discrepancies, modify their code, and test the revised solution.

Algorithm construction may also benefit from repeated opportunities for independent problem solving. Similarly, visual representations of conditional and iterative structures may facilitate students' understanding of abstract algorithmic relationships.

However, these expectations should not be interpreted as predetermined findings. The final conclusions must be based on the empirical data and statistical analyses obtained after implementation of the intervention.

14. Discussion

The proposed framework positions programming education as a context for developing algorithmic reasoning rather than merely teaching programming commands. This distinction is important because students who can reproduce a demonstrated program may not necessarily possess the ability to independently formulate an algorithmic solution.

The digital learning platform is therefore conceptualized as a didactic environment that supports an iterative problem-solving cycle. Students are expected to move repeatedly between planning, implementation, testing, error identification, and refinement.

This approach is consistent with research demonstrating the potential of programming environments to support computational thinking development (Fagerlund et al., 2021; Zhang & Nouri, 2019). It is also consistent with evidence emphasizing the importance of activity design, project-based learning, and game-based approaches in computational thinking education (Pan et al., 2024; Sun et al., 2021; Zhang et al., 2024).

At the same time, the proposed framework extends this perspective by focusing specifically on algorithmic thinking as a measurable educational outcome. Instead of treating algorithmic

reasoning as one implicit component of computational thinking, the model separates six dimensions that can be assessed independently.

The emphasis on decomposition, sequencing, conditional reasoning, iteration, debugging, and algorithm construction also corresponds to the practical activities through which programming competence is developed. This provides a direct connection between instructional tasks and assessment criteria.

The use of block-based programming is particularly appropriate for the target age group. Previous research comparing block-based and text-based programming suggests that visual programming can reduce barriers associated with programming syntax and influence novice programming practices (Weintrop & Wilensky, 2017, 2018). This allows instructional attention to shift toward the logical organization of solutions.

Nevertheless, the study recognizes that technology alone does not guarantee learning. The effectiveness of the digital environment depends on the quality of its instructional design. A platform that merely presents exercises electronically may provide limited additional pedagogical value. In contrast, a platform incorporating progressive task difficulty, immediate feedback, debugging opportunities, project-based learning, and progress monitoring may provide a substantially richer environment for algorithmic development.

Therefore, the proposed study focuses not simply on whether digital learning is effective, but on how a deliberately designed digital learning environment may support specific algorithmic competencies.

15. Scientific Contribution

The study is expected to contribute to programming education research in several respects.

First, it provides a conceptualization of algorithmic thinking as a distinct, multidimensional outcome within school programming education.

Second, it proposes a six-component framework for assessing algorithmic thinking among 5th–6th grade students.

Third, it connects instructional design with assessment by aligning learning activities directly with the targeted algorithmic competencies.

Fourth, it proposes a comparative research design through which digital-platform-based and traditional programming instruction can be evaluated under comparable educational conditions.

Finally, the framework may provide a basis for examining the extent to which students' algorithmic development varies according to grade level.

16. Practical Implications

The proposed framework has practical implications for teachers, curriculum designers, and developers of digital educational platforms.

For teachers, the component-based assessment framework can help identify the specific algorithmic skills in which individual students experience difficulty. Instead of assigning a single programming score, teachers can determine whether a learner needs additional support in sequencing, decomposition, conditional reasoning, iteration, debugging, or algorithm construction.

For curriculum developers, the proposed instructional sequence provides a structure for integrating algorithmic reasoning into programming education.

For digital platform developers, the model suggests that platforms should incorporate not only programming exercises but also mechanisms for immediate feedback, error diagnosis, progressive difficulty, project-based tasks, and learner-progress monitoring.

Such features can transform a digital platform from an electronic repository of exercises into an interactive didactic environment that supports systematic cognitive development.

17. Limitations and Directions for Future Research

Several limitations should be considered.

First, the proposed study design requires empirical implementation before definitive conclusions regarding the effectiveness of the digital platform can be drawn.

Second, the effectiveness of the intervention may depend on students' prior programming experience, teacher expertise, instructional duration, and the specific characteristics of the digital platform.

Third, the six-component model represents an operational framework developed for the purposes of this study and should be further examined through empirical validation.

Future research should therefore investigate the reliability and validity of the proposed assessment framework, examine the model with larger and more diverse samples, and compare different digital programming environments.

Longitudinal studies may also determine whether improvements in algorithmic thinking are maintained over time and whether early development of these skills predicts later programming achievement.

18. Conclusion

This study proposes a theoretically grounded and empirically testable framework for developing algorithmic thinking among 5th–6th grade students through digital learning platforms in programming education.

The framework is based on the assumption that programming instruction can serve as an effective context for developing structured problem-solving abilities when students are actively involved in problem decomposition, algorithm design, programming, testing, debugging, and reflection.

Algorithmic thinking is operationalized through six components: sequencing, decomposition, conditional reasoning, iterative reasoning, debugging, and algorithm construction. These components provide a more detailed basis for assessing students' algorithmic development than a single general measure of computational thinking.

A quasi-experimental pretest–posttest control-group design is proposed to compare digital-platform-based programming instruction with traditional instruction. The design also enables examination of differences between 5th- and 6th-grade students and analysis of the individual components most responsive to the intervention.

The study does not assume empirical outcomes in advance. Rather, it establishes a methodological framework through which the effectiveness of digital learning platforms can be tested systematically.

If supported by subsequent empirical evidence, the proposed approach may contribute to the modernization of programming education, the development of evidence-based digital didactic resources, and the implementation of more diagnostic approaches to assessing algorithmic thinking among school-aged learners.

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DEVELOPING CULTURE AND ARTS MANAGEMENT IN UZBEKISTAN: A CONCEPTUAL FRAMEWORK FOR EDUCATION, ENTREPRENEURSHIP, DIGITALIZATION, AND INSTITUTIONAL GOVERNANCE

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Annotation. *Culture and arts management has become increasingly important as cultural institutions are expected to preserve cultural values while also responding to market change, digital transformation, international competition, and new forms of creative entrepreneurship. This article develops a conceptual framework for strengthening culture and arts management in Uzbekistan. It addresses a gap in the existing discussion, which often describes the importance of management but does not sufficiently connect education, institutional governance, market development, digital infrastructure, public-private partnership, and international cooperation within a single analytical model. The study uses qualitative document analysis and narrative literature synthesis. It draws on Uzbek scholarship cited in the original manuscript, international research on arts management and cultural entrepreneurship, UNESCO and UNCTAD policy frameworks, and recent official policy documents on the creative economy and cultural development in Uzbekistan. The analysis identifies six interdependent dimensions of effective culture and arts management: governance and institutional capacity; professional education and human capital; creative entrepreneurship and market access; digital infrastructure and information systems; public-private and international cooperation; and monitoring of cultural, social, and economic value. The paper argues that these dimensions should be developed as an integrated system rather than as isolated initiatives. Strategic recommendations are offered for higher education institutions, cultural organizations, policymakers, and creative-sector stakeholderss.*

Keywords: *culture management, arts management, creative economy, cultural entrepreneurship, management education, digitalization, public-private partnership, Uzbekistan.*

Introduction

Culture and the arts contribute simultaneously to identity, social cohesion, education, creativity, and economic activity. Their management therefore differs from ordinary commercial management because cultural organizations must balance artistic and social missions with financial sustainability, organizational effectiveness, audience development, and accountability. Throsby (2001) emphasizes that cultural goods possess both economic and cultural value, while Byrnes (2022) shows that arts management requires integrated competence in planning, leadership, staffing, finance, marketing, operations, and evaluation. This dual character explains why culture and arts management cannot be reduced either to administrative control or to profit maximization.

The importance of this field is increasing in Uzbekistan. The Law "On the Creative Economy," adopted in October 2024 (Republic of Uzbekistan, 2024), established a legal basis for supporting creative industries, infrastructure, and related forms of state support. Subsequent policy initiatives have emphasized improved management and financing in culture, public-private partnership, creative start-ups, international cooperation, and the introduction of foreign experience. Official information presented in 2026 reported that the creative economy accounted for 3.7% of Uzbekistan's GDP in 2024, with a value of 56.8 trillion soums, exports of approximately USD 770.6 million, and employment of more than 319,000 people (President of the Republic of Uzbekistan, 2026b). These developments show that culture and creative activity are no longer only social-policy concerns; they are also increasingly connected with employment, enterprise, technology, and international markets.

The original discussion of culture and arts management in Uzbekistan correctly emphasizes national values, youth development, entrepreneurship, managerial responsibility, and the need for modern organizational methods. However, the central methodological problem is that these elements are often discussed separately. A clearer framework is needed to explain how cultural values, professional management, education, market mechanisms, digital systems, and institutional reform should interact.

Accordingly, this study addresses three research questions:

1. What organizational principles should underpin effective culture and arts management in Uzbekistan?

2. How can management education, creative entrepreneurship, digitalization, public-private partnership, and international cooperation be integrated into a coherent development system?

3. What practical framework can guide cultural institutions and higher education organizations in implementing these priorities?

The objective is not to claim empirical effects that have not yet been measured. Instead, the article develops a conceptual model grounded in relevant literature and current policy documents, and it identifies priorities that can later be tested through surveys, interviews, institutional case studies, and performance data.

Literature Review

Arts management and the balance of cultural and economic value

Modern arts management combines general management functions with the distinctive characteristics of artistic production. Creative products are uncertain, differentiated, and dependent on artistic judgment, while their production often requires coordination among creators, managers, funders, venues, intermediaries, and audiences (Caves, 2003). For this reason, arts managers operate across artistic, organizational, and economic domains.

Throsby (2001) provides an important foundation by distinguishing economic value from cultural value. Cultural organizations may generate income and employment while also producing symbolic, educational, historical, and social benefits that cannot be captured fully through market prices. Effective management therefore requires a balanced approach: financial discipline is necessary, but management decisions should also protect cultural mission, diversity, access, and artistic freedom.

Uzbek scholarship similarly connects management with the development of cultural institutions, creative activity, and professional responsibility. Haydarov (2019) stresses planning and management in creative activity, while Qosimova (2011) addresses core management theory relevant to organizational decision-making. These perspectives support the view that cultural-sector management should be systematic rather than improvised.

Cultural entrepreneurship and professional capability

Entrepreneurship is increasingly important in the arts because cultural workers often need to mobilize resources, build audiences, organize projects, negotiate partnerships, and create sustainable forms of professional activity. Preece (2011) argues that performing-arts

entrepreneurship should be understood in relation to the value chain, available resources, audiences, venues, and artistic inputs. Essig (2015) likewise presents arts entrepreneurship as a process through which artistic activity can be organized sustainably. Entrepreneurship in culture should therefore not be interpreted narrowly as commercialization; it can support artistic autonomy, adaptability, and the creation of artistic, social, and economic value.

This has implications for higher education. Students in culture and arts programs require more than theoretical knowledge. They need competencies in project design, budgeting, fundraising, communication, digital promotion, intellectual property, teamwork, negotiation, audience analysis, and entrepreneurial decision-making. Hanson (2021) demonstrates the growing importance of structured approaches to developing entrepreneurial capacities among arts students. In Uzbekistan, management education can serve as a bridge between artistic education and the changing institutional and market environment.

Governance, digitalization, and cultural policy

The 2005 Convention framework of the United Nations Educational, Scientific and Cultural Organization (UNESCO, 2026) treats sustainable cultural governance as dependent on informed policymaking, participation, skills, access, diversity, mobility, digital development, and protection of cultural expression. Its 2026 monitoring framework places particular emphasis on governance systems, digital creativity and markets, civil-society participation, mobility of cultural professionals, and integration of culture into sustainable development.

Digital transformation is especially important because cultural markets increasingly depend on online discovery, communication, ticketing, promotion, distribution, databases, digital archives, and platform-based transactions. United Nations Conference on Trade and Development (UNCTAD, 2024) reports the growing importance of creative services in international trade and emphasizes the economic contribution of creative industries across countries. For Uzbekistan, this strengthens the case for digital infrastructure that connects artists, managers, institutions, consumers, employers, and investors.

Methodology

This article uses a qualitative conceptual research design based on document analysis and narrative literature synthesis. The approach is appropriate because the purpose is to construct and justify a management framework rather than to estimate causal effects or report original survey results.

The source base consists of four groups of materials: (1) Uzbek scholarly and educational works on management, culture, and creative activity cited in the original manuscript; (2) established international literature on cultural economics, arts management, and arts entrepreneurship; (3) international policy frameworks from UNESCO and UNCTAD; and (4) recent official documents and policy communications concerning the creative economy, cultural management, public-private partnership, education, and cultural-sector development in Uzbekistan.

Materials were selected purposively according to their relevance to the research questions. The analysis compared recurring themes across the sources and grouped them into institutional dimensions. Particular attention was given to areas where the original manuscript's recommendations overlapped with international management literature and current national policy. The method does not provide statistical generalization. Its value lies in conceptual integration and in generating a framework that can be tested empirically in future research.

A Conceptual Framework for Culture and Arts Management Development

The analysis identifies six mutually reinforcing dimensions.

Table 1

Integrated Framework for Culture and Arts Management Development

Dimension	Core mechanisms	Expected contribution
Governance and institutional capacity	Strategic planning; clear responsibilities; transparent decision-making; professional leadership; financial and operational accountability.	More stable and efficient cultural organizations.
Professional education and human capital	Management curricula; entrepreneurship training; internships; project-based learning; leadership and communication skills.	Managers capable of working across artistic, social, and economic objectives.
Creative entrepreneurship and market access	Start-up support; project financing; creative tenders; market platforms; audience development; intellectual-property awareness.	Sustainable creative careers, stronger cultural enterprises, and diversified income.
Digital infrastructure and information systems	Event and vacancy databases; digital marketing; ticketing; creative-service marketplaces; institutional data systems.	Lower transaction costs, better access to opportunities, and stronger market visibility.
Public-private and international cooperation	PPP models; sponsorship; co-production; foreign partnerships; professional mobility; international internships and exchange.	Additional resources, knowledge transfer, and international market access.
Monitoring of cultural, social, and economic value	Performance indicators; audience and participation data; financial measures; social-impact measures; periodic evaluation.	Evidence-based management and improved accountability.

Note. PPP = public-private partnership.

The framework treats these dimensions as a system. Digital platforms, for example, are unlikely to succeed without skilled managers, reliable institutional data, clear governance, and active market participants. Similarly, entrepreneurship education has limited impact if graduates cannot access financing, networks, venues, or transparent opportunities. Management development therefore requires coordinated institutional design.

Discussion and Strategic Priorities

Strengthening governance and professional management

Cultural institutions require managers who understand both cultural mission and organizational performance. Management structures should clearly distinguish strategic objectives, operational responsibilities, financial control, artistic decision-making, and evaluation. This does not mean subordinating artistic activity to business logic. Rather, professional management should create conditions in which artistic work can be sustained, distributed, and developed.

Recent Uzbek policy already points in this direction. In 2025, official proposals emphasized improvement of management and financing in culture, the use of public-private partnership mechanisms in cultural centers, support for creative start-ups, and gradual introduction of advanced foreign experience (President of the Republic of Uzbekistan, 2025). These reforms should be accompanied by transparent recruitment and professional-development systems for cultural managers.

Reforming arts-management education

Higher education institutions should move from predominantly descriptive teaching toward competency-based management education. A modern curriculum should combine management theory with cultural-policy analysis, project management, budgeting, marketing, fundraising, digital communication, entrepreneurship, copyright, audience development, negotiation, and data-based evaluation.

The original recommendation to increase student participation is particularly important. Students should design real cultural projects, prepare budgets, build communication strategies, work with cultural institutions, and evaluate outcomes. Internship agreements with theaters,

museums, cultural centers, festivals, creative companies, and international arts organizations would connect classroom learning with professional practice. National competitions for young cultural managers could also identify talent and stimulate innovation.

Building digital cultural-market infrastructure

One of the strongest proposals in the original manuscript is the creation of a unified electronic platform for the creative market. This idea can be developed into an integrated digital ecosystem rather than a single informational website. Such a system could include cultural-event listings, creative-sector vacancies, professional portfolios, calls for tenders, project opportunities, venue information, training resources, and links to ticketing or contracting services.

The main managerial benefit would be reduced information fragmentation. Artists often need access to institutions, managers need access to creative professionals, cultural organizations need audiences and contractors, and students need internships and vacancies. A well-designed platform could connect these groups while generating useful sector data. Data governance, privacy, transparent participation rules, and long-term financing would be essential.

Supporting creative entrepreneurship without weakening cultural mission

Uzbekistan's creative-economy policy provides a stronger environment for cultural entrepreneurship. The 2024 law established a formal legal framework, and later measures created incentives for creative-industry development and international participation. By 2026, state policy was also emphasizing creative-industry parks, expanded private-sector participation, and a larger economic role for creative activity (President of the Republic of Uzbekistan, 2026a; 2026b).

Management policy should therefore support multiple organizational models: public institutions, nonprofit organizations, independent artists, creative enterprises, social enterprises, and public-private initiatives. Support instruments can include competitive grants, transparent creative tenders, incubators, professional mentoring, small-project financing, and business-development services. However, evaluation criteria should recognize artistic and social value alongside revenue.

Expanding public-private and international cooperation

Public-private partnership can improve infrastructure, introduce additional expertise, and diversify financing, but it should be governed by clear cultural objectives and accountability rules. Partnerships are most useful when public institutions define the cultural mission and access requirements while private participants contribute investment, services, technology, or market expertise.

International cooperation should extend beyond symbolic exchanges. Priority should be given to professional placements, joint training, co-production, management residencies, and adaptation of tested foreign practices to Uzbekistan's institutional context. The original proposal to send students to foreign arts-management organizations is therefore well founded, but such programs should include learning objectives, structured supervision, and post-program knowledge transfer.

Introducing monitoring and evaluation

A major weakness in cultural management is the tendency to evaluate activity only through the number of events or the amount of funding spent. A modern management system should combine several types of indicators: financial sustainability, audience reach, participation, regional access, digital engagement, employment, partnerships, artistic output, educational impact, and stakeholder satisfaction.

This approach is consistent with UNESCO's emphasis on evidence-informed governance. It would also make future research more rigorous. Once comparable institutional data are available, researchers can test which management practices are associated with stronger cultural, social, and economic outcomes.

Conclusion

The development of culture and arts management in Uzbekistan requires a shift from fragmented administrative activity toward an integrated management system. The conceptual

analysis presented in this article identifies six connected priorities: stronger institutional governance, professional education, creative entrepreneurship, digital infrastructure, public-private and international cooperation, and systematic monitoring of cultural, social, and economic value.

The paper's principal contribution is to organize these priorities into a single framework that links the cultural mission of institutions with contemporary management requirements. This is particularly relevant as Uzbekistan expands its creative economy, strengthens the legal environment for creative industries, develops new cultural infrastructure, and seeks greater international participation.

Three practical implications follow. First, higher education institutions should modernize arts-management curricula around applied professional competencies. Second, cultural organizations and policymakers should develop digital and organizational infrastructure that connects creators, managers, audiences, employers, and investors. Third, cultural-sector reforms should be evaluated through evidence rather than through activity counts alone.

The study is limited by its conceptual and document-based design. It does not measure the effectiveness of particular institutions or policies. Future research should therefore test the proposed framework through surveys of cultural managers and students, interviews with institutional leaders, comparative case studies, and analysis of organizational performance indicators. Such empirical work would allow the framework to be refined and adapted across different cultural sectors and regions of Uzbekistan.

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CHEMISTRY EDUCATION AS A FOUNDATION FOR PROFESSIONAL COMPETENCE IN MEDICAL HIGHER EDUCATION: A CONCEPTUAL REVIEW AND FRAMEWORK

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Abstract. *Chemistry is a foundational science for medicine and pharmacy, yet its contribution to professional competency development is often described only in terms of content knowledge. This conceptual review examines how chemistry education can contribute more directly to professional competence in medical higher education. A targeted narrative review of peer-reviewed literature and professional guidance published through August 2026 was conducted across competency-based medical education, basic-clinical science integration, chemistry laboratory education, active learning, clinical reasoning, reflective practice, and professional skills. The synthesis indicates that chemistry can support professional development through five interrelated pathways: conceptual-clinical integration; experimental and research competence; analytical problem solving and evidence use; scientific communication, collaboration, and information management; and reflective self-regulation and professional growth. These pathways are brought together in the proposed Chemistry-Enabled Professional Competence (CEPC) framework. The review also identifies conditions required for these benefits to occur: clinically authentic context, active and inquiry-oriented learning, deliberate scaffolding, timely feedback, safe laboratory practice, and constructive alignment between outcomes, teaching activities, and assessment. The framework is intended as a curriculum-design tool rather than an empirically validated model. It offers a practical basis for redesigning chemistry instruction in medical and pharmacy programs so that foundational chemical knowledge is taught, practiced, and assessed in ways that contribute visibly to future professional performance.*

Keywords: *chemistry education; professional competence; competency-based education; medical education; laboratory learning; clinical reasoning; reflective practice; curriculum integration*

1. Introduction

Competency-based education has shifted attention in health professions education from the amount of content delivered toward the abilities graduates can demonstrate in authentic professional contexts. In competency-based medical education, competence is understood as an integrated capacity that brings together knowledge, skills, attitudes, judgment, and performance rather than as the possession of isolated facts (Frank et al., 2010; Gruppen et al., 2012). This shift has implications for every foundational science in the curriculum. A chemistry course for medical or pharmacy students should therefore be judged not only by whether students can reproduce chemical laws, but also by whether they can use chemical reasoning to interpret biological processes, evaluate evidence, work safely with measurements and materials, communicate scientific conclusions, and learn from error and feedback.

Chemistry has a particularly strong potential to support these outcomes because it connects molecular mechanisms with observable physiological, biochemical, pharmaceutical, and diagnostic phenomena. Acid-base equilibria, redox reactions, intermolecular interactions, chemical kinetics, thermodynamics, solubility, and quantitative solution chemistry are not merely prerequisites for later courses; they are explanatory tools that can help students construct causal accounts of clinical and pharmaceutical problems. Research on integration in medical education emphasizes that foundational science becomes educationally powerful when learners actively connect it with clinical knowledge rather than encounter it as a detached preclinical block (Kulasegaram et al., 2013; Brauer & Ferguson, 2015; Bandiera et al., 2018). Recent work in medical biochemistry likewise shows the value of case-based, team-oriented activities that require learners to connect biochemical mechanisms with diagnostic and therapeutic reasoning (Schmidt et al., 2024).

The professional potential of chemistry also extends beyond conceptual integration. Laboratory education can expose students to measurement, uncertainty, documentation, data analysis, experimental design, safety, collaboration, and scientific communication. However, the laboratory should not be romanticized as automatically effective. Chemistry education research has repeatedly warned that traditional recipe-style laboratory activities and conventional reports do not necessarily produce the intended learning outcomes unless the curriculum deliberately aligns learning goals, activities, feedback, and assessment (Bretz, 2019; Seery, 2020; Seery et al., 2024; Lo & Greenberg, 2026). In parallel, active-learning evidence across STEM education indicates that students generally perform better when they engage cognitively with problems instead of receiving information only through lecture (Freeman et al., 2014).

Despite these complementary literatures, chemistry education and health professions education are often discussed separately. Regional Uzbek and Russian-language pedagogical scholarship also offers competency-based and acmeological perspectives that emphasize professional formation, contextual learning, self-development, and professional maturity (Muslimov, 2007; Verbitsky, 2004; Derkach, 2004; Kuzmina, 2002). For an international readership, these ideas can be productively connected with established constructs such as self-regulated learning, reflective practice, and professional identity formation (Mann et al., 2009; Sandars & Cleary, 2011; Cruess et al., 2014). The present article integrates these complementary traditions in a literature-grounded conceptual review focused specifically on medical higher education and proposes an integrative framework for curriculum design.

2. Aim and guiding question

The aim of this article is to explain how chemistry education can be intentionally designed to contribute to professional competence in medical higher education. The guiding question is: Through which curricular mechanisms can chemistry education support professional competency development in medical and pharmacy students, and how should those mechanisms be taught and assessed? The article has four objectives: to synthesize relevant evidence from chemistry education and health professions education; to clarify the role of clinically contextualized chemistry in foundational-science integration; to propose a coherent conceptual framework; and to translate that framework into practical curriculum and assessment recommendations.

3. Review design and scope

This article uses a targeted narrative review and conceptual synthesis rather than a systematic review or meta-analysis. Searches were conducted through August 2026 across PubMed and publisher platforms relevant to chemistry education, including ACS Publications and

Royal Society of Chemistry journals, supplemented by current professional guidance from the American Chemical Society. Search concepts included combinations of chemistry education, laboratory learning, professional competencies, competency-based education, medical education, foundational or basic science integration, clinical reasoning, problem-based learning, active learning, reflection, self-regulated learning, professional identity, and acmeology.

Priority was given to peer-reviewed reviews, consensus or guidance papers, empirical studies with direct relevance to higher education, and authoritative professional standards. Foundational publications were retained where they remain conceptually influential, while recent literature was used to update laboratory design, active learning, professional skills, and medical-science integration. The purpose of the review was conceptual integration rather than exhaustive effect estimation; accordingly, PRISMA procedures and formal risk-of-bias scoring were not applied. No human participants were recruited and no new dataset was generated, so research ethics approval was not applicable to this conceptual review.

4. Professional competence as an integrated educational outcome

A useful starting point is to distinguish competence from content mastery. Competency-based medical education emphasizes observable abilities and progression toward professional performance, while competency-based health professions education more broadly organizes curricula around the needs of patients and health systems rather than around fixed exposure time alone (Frank et al., 2010; Gruppen et al., 2012). In chemistry education, professional standards similarly treat scientific preparation as a combination of disciplinary knowledge and professional skills. The 2023 American Chemical Society guidelines emphasize communication, information retrieval and management, teamwork, ethical professional conduct, systems thinking, and progressively more complex laboratory skills as curricular responsibilities rather than optional extras (American Chemical Society, 2023).

For medical higher education, this integrated view is important because chemistry is rarely the terminal professional activity. Future physicians and pharmacists do not primarily need to behave as professional chemists; they need to use chemically informed reasoning appropriately within broader biomedical and patient-care contexts. Consequently, the relevant question is not whether every chemistry skill transfers directly to clinical work, but whether chemistry provides structured opportunities to develop transferable forms of reasoning, evidence use, precision, safety, communication, and self-correction that contribute to later professional performance.

5. Conceptual-clinical integration: from chemical principles to clinical reasoning

Medical curricula have long struggled with the separation of basic and clinical sciences. Integration is not achieved simply by placing basic-science and clinical material in the same timetable; learners must form meaningful cognitive links that allow foundational mechanisms to explain clinical phenomena (Kulasegaram et al., 2013). Integrated-curriculum guidance similarly emphasizes deliberate horizontal and vertical connections across subjects and stages of training (Brauer & Ferguson, 2015). Bandiera et al. (2018) argue that contemporary integration should be understood both as a curricular structure and as a cognitive activity in which learners connect science with practice.

Chemistry can make those links explicit. Acid-base chemistry can be taught through blood-buffer systems and disturbances of acid-base balance; solution chemistry and electrolytes can be linked to ion distributions and laboratory values; oxidation-reduction concepts can support interpretation of oxidative processes; intermolecular forces, ionization, and solubility can be connected with drug formulation and molecular interactions; and analytical chemistry can be

related to the principles underlying diagnostic measurement. The educational purpose of such contexts is not to replace later clinical teaching, but to make chemical principles causally useful and retrievable when students later encounter clinical problems.

The clinical-reasoning literature supports this emphasis on knowledge-rich, contextually organized learning. A consensus statement on undergraduate clinical reasoning concluded that explicit, longitudinal curriculum design should help learners build and apply knowledge rather than rely on generic thinking heuristics alone (Cooper et al., 2021). In medical biochemistry, Schmidt et al. (2024) demonstrated a practical model in which small-group cases were used to connect biochemical concepts with diagnosis and treatment reasoning. For chemistry courses, the implication is clear: clinically authentic cases should be used selectively to activate chemical mechanisms, not as decorative examples added after the conceptual teaching is complete.

6. Laboratory learning and experimental-research competence

The laboratory is the most distinctive educational environment available to chemistry, but its value depends on design. Bretz (2019) emphasized the need for stronger evidence regarding what students actually learn from laboratory courses. Seery (2020) subsequently argued that the central purpose of the undergraduate chemistry laboratory should be to help students learn how to do chemistry, rather than merely verify lecture content. More recent synthesis has translated this principle into practical guidance for laboratory design, emphasizing coherent learning outcomes, preparation, student support, meaningful activity, feedback, and assessment (Seery et al., 2024). Lo and Greenberg (2026) further highlight constructive alignment across cognitive, psychomotor, and affective domains and review assessment practices that better match intended laboratory outcomes.

For medical and pharmacy students, the laboratory can therefore be designed around competencies rather than a sequence of recipes. Students can be required to prepare and dilute solutions accurately, maintain reliable records, recognize sources of measurement uncertainty, interpret calibration data, follow safety procedures, make decisions when results deviate from expectations, and explain the evidential basis of a conclusion. These tasks develop habits that are relevant well beyond chemistry: precision, traceability, awareness of uncertainty, responsible data handling, and disciplined interpretation.

Laboratory competence should also be progressively scaffolded. Pre-laboratory activities can reduce unnecessary cognitive load by preparing students for concepts, procedures, and safety expectations before they enter the practical environment (Agustian & Seery, 2017). Faculty surveys show that chemistry laboratory goals commonly include research experience, data analysis, error analysis, group work, communication, transferable skills, and scientific writing, particularly at more advanced levels (Connor et al., 2023). A medical chemistry curriculum can adapt these goals to the level and professional needs of its students while avoiding unrealistic claims that a single introductory laboratory course creates fully developed research competence.

7. Active, problem-based, and context-rich learning

Professional competence requires learners to use knowledge, not only receive it. The large meta-analysis by Freeman et al. (2014) found that active learning improved student performance across undergraduate STEM fields compared with traditional lecturing. In postsecondary chemistry, problem-based learning, process-oriented guided inquiry, and other engagement pedagogies are established approaches, although their adoption varies across contexts (Raker et al., 2021). Dynamic problem-based learning in chemistry has also been used to connect disciplinary learning with real-world problems and transferable skills (Overton & Randles, 2015).

For medical chemistry, active learning is most defensible when tasks demand chemical reasoning that has a plausible professional analogue. Instead of asking students to repeat a definition of buffer capacity, a small-group problem can require them to interpret how changes in acid-base equilibria alter a simplified physiological scenario. Instead of calculating concentration in isolation, students can analyze a preparation or dilution problem in which unit consistency, significant figures, and error consequences matter. Such tasks make the professional relevance of chemistry visible, increase the need for explanation and peer discussion, and create opportunities for formative feedback.

Context must nevertheless be used carefully. If a clinical case becomes so complex that learners can solve it only through memorized medical facts, the chemistry objective disappears. The preferred design is therefore a controlled context in which the chemical mechanism remains necessary for a successful explanation. This principle is consistent with contextual learning traditions represented by Verbitsky (2004): educational activity becomes more professionally meaningful when academic knowledge is embedded in situations that resemble the logic of future practice.

8. Communication, collaboration, information management, and professional conduct

Chemistry courses can also provide repeated, assessable opportunities to develop professional skills. Current ACS guidance expects chemistry programs to develop scientific writing and speaking, information retrieval and evaluation, teamwork, ethical data practices, and systems thinking across the curriculum (American Chemical Society, 2023). These expectations align with contemporary laboratory goals identified by chemistry faculty, including group work, broader communication skills, error analysis, data collection and analysis, and laboratory writing (Connor et al., 2023).

In a medical higher-education context, these skills can be reframed around the future health professional. Students may prepare a concise laboratory interpretation for a non-specialist audience, justify a conclusion using a small set of data, compare the quality of two scientific sources, document calculations so that another person can audit them, or complete a team task in which responsibilities and evidence are explicit. Digital competence should be treated as information competence rather than simple device use: students should learn to locate reliable chemical information, judge source quality, manage references, and present quantitative information accurately.

Professional conduct is particularly important in laboratory work. Safe handling, accurate record keeping, responsible treatment of data, and correct citation are observable behaviors that can be taught and assessed. Such practices also provide an early bridge to later expectations in biomedical laboratories, pharmacy, and clinical environments, where traceability and responsible communication are essential.

9. Reflection, self-regulated learning, and professional growth

Reflection is most useful when it is linked to specific performance evidence rather than treated as a generic writing exercise. A systematic review of reflection in health professions education found a developing but heterogeneous evidence base and emphasized the importance of educational context and facilitation (Mann et al., 2009). Self-regulated learning theory provides a complementary mechanism: learners set goals, select strategies, monitor performance, interpret feedback, and adapt their behavior in iterative cycles (Sandars & Cleary, 2011). Chemistry

laboratories naturally generate occasions for this cycle when students compare expected and observed results, diagnose errors, revise procedures, and plan the next step.

These processes can also contribute to professional identity formation. Medical education literature increasingly treats professional identity as something developed through participation, reflection, role models, and progressive responsibility rather than as a fixed personal attribute (Cruess et al., 2014). Chemistry cannot create a medical professional identity by itself, but it can contribute to habits of scientific responsibility: asking what the evidence supports, recognizing limits, documenting work transparently, and revising conclusions when data change.

The acmeological tradition can be positioned here as a complementary regional perspective. Acmeology focuses on personal and professional development toward higher levels of maturity and self-realization (Derkach, 2004; Kuzmina, 2002). Muslimov (2007) similarly emphasizes professional formation in vocational education. For international readers, these ideas are best treated not as a substitute for contemporary educational evidence, but as a conceptual lens that overlaps with reflective practice, self-regulation, lifelong learning, and professional growth. This positioning connects regional pedagogical concepts with constructs that are more widely used in current health professions education.

10. The Chemistry-Enabled Professional Competence (CEPC) framework

The literature synthesis suggests that the professional contribution of chemistry is best understood as a set of pathways rather than a single outcome. The proposed Chemistry-Enabled Professional Competence (CEPC) framework organizes these pathways into five domains: (1) conceptual-clinical integration; (2) experimental-research competence; (3) analytical problem solving and evidence use; (4) communication, collaboration, and information management; and (5) reflective self-regulation and professional growth. The framework does not claim that chemistry alone produces professional competence. Instead, it identifies specific educational functions through which chemistry can contribute to a broader medical or pharmacy curriculum.

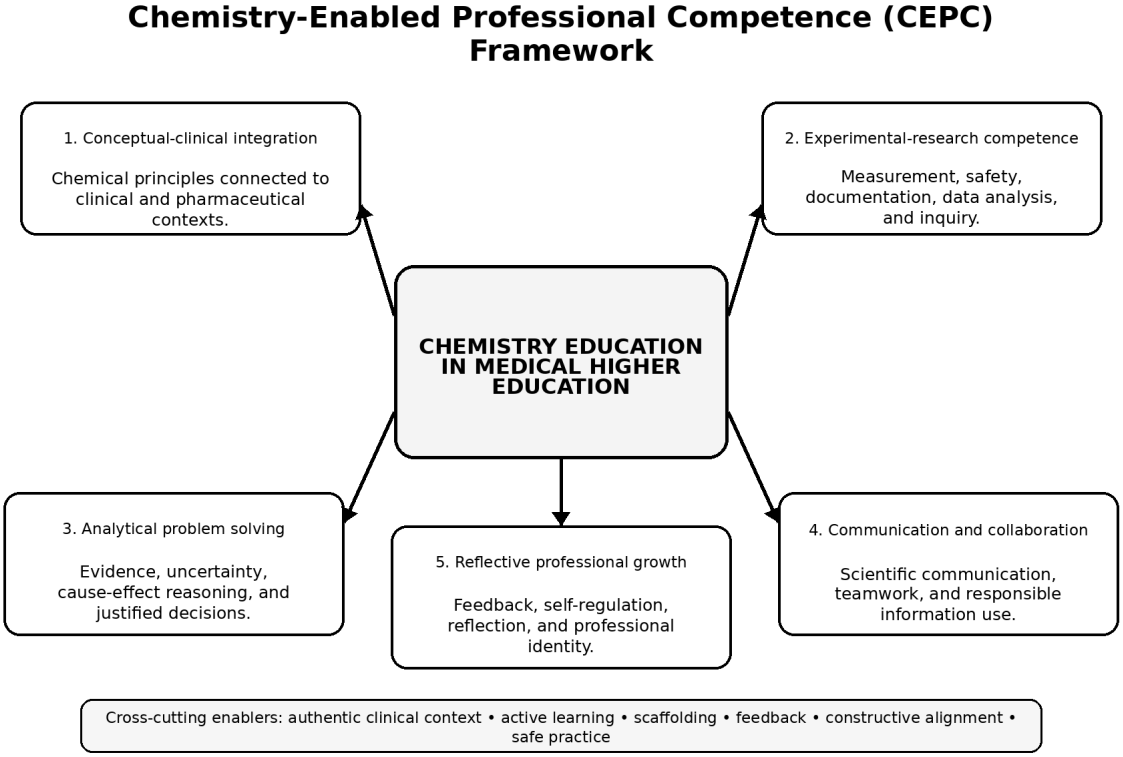


Figure 1. Chemistry-Enabled Professional Competence (CEPC) framework. Source: Author's conceptual synthesis based on the literature reviewed in this article.

The framework also identifies six cross-cutting enablers. First, professional relevance should be made visible through authentic but educationally controlled clinical or pharmaceutical contexts. Second, students should actively explain, calculate, interpret, design, or decide rather than only listen. Third, complexity should be scaffolded so that students can progress from well-structured tasks to more open problems. Fourth, feedback should be timely and connected to explicit criteria. Fifth, learning outcomes, teaching activities, and assessment should be constructively aligned. Sixth, safe and responsible scientific practice should be integrated throughout rather than treated as a separate introductory topic.

11. Curriculum and assessment implications

A defensible competency-based curriculum requires evidence that the intended competencies are actually taught and assessed. Table 1 translates the CEPC framework into a practical curriculum blueprint. The examples are intentionally adaptable: they can be used in general chemistry, bioinorganic chemistry, medical chemistry, or introductory analytical and pharmaceutical chemistry depending on local program structure.

CEPC pathway	Illustrative learning activity	Observable student performance	Suitable assessment evidence
Conceptual-clinical integration	Analyze acid-base, electrolyte, solubility, or redox scenarios with controlled clinical context.	Explains the relevant chemical mechanism and links it to the case without replacing chemistry with memorized clinical facts.	Case-based short answer; concept map; structured oral explanation.
Experimental-research competence	Prepare solutions, generate measurements, document procedures, analyze uncertainty, and troubleshoot results.	Performs safely and accurately; records traceable data; identifies error sources; draws proportionate conclusions.	Direct practical observation; laboratory notebook; data-analysis task; short post-lab reflection.
Analytical problem solving and evidence use	Interpret an unfamiliar dataset or compare competing explanations for an experimental result.	Uses quantitative evidence, distinguishes observation from inference, and justifies a defensible decision.	Data interpretation problem; structured problem-solving rubric; viva/oral reasoning task.
Communication, collaboration, and information management	Complete a team investigation and communicate findings to scientific and non-specialist audiences using reliable sources.	Shares responsibility, cites sources, presents data clearly, and adapts communication to audience.	Team-product rubric plus individual component; short scientific report; oral presentation; source-evaluation exercise.
Reflective professional growth	Use feedback from a practical or problem-solving task to identify an error pattern and plan a corrective strategy.	Recognizes limitations, explains what changed in understanding or strategy, and specifies a realistic improvement action.	Brief structured reflection; learning plan; resubmission with response-to-feedback statement.

Table 1. Curriculum and assessment blueprint derived from the CEPC framework.

The table also illustrates an important assessment principle: competencies should be inferred from performance evidence that matches the intended outcome. If the goal is accurate

experimental technique, a written laboratory report alone is insufficient because it samples writing more directly than psychomotor performance. If the goal is teamwork, grading only the final group product does not reveal individual collaborative behavior. Constructive alignment therefore requires multiple forms of evidence, proportionate to course level and available resources (Holmboe et al., 2010; Lo & Greenberg, 2026).

A feasible implementation strategy is to identify a small number of CEPC outcomes for each chemistry course rather than attempt to assess all pathways in every unit. For example, an introductory course may emphasize conceptual-clinical integration and quantitative problem solving, while laboratory sessions emphasize safe practice, data quality, and reflection. Later courses can add open-ended design, literature use, team communication, and more authentic pharmaceutical or diagnostic problems. This developmental structure is consistent with the progressive skill expectations described in current chemistry professional guidance (American Chemical Society, 2023).

12. Implications for medical and pharmacy educators

The central implication is that professional relevance should influence curriculum architecture rather than appear only in examples. Chemistry faculty and clinical or pharmacy faculty can jointly identify a limited set of high-value contexts in which chemical mechanisms genuinely explain later professional content. Such collaboration helps avoid two common errors: teaching excessive chemical detail without a clear curricular purpose, and using superficially clinical scenarios in which chemistry is not actually needed.

Second, practical work should be designed around explicit competencies and evidence. A smaller number of well-aligned experiments may contribute more to professional formation than a larger number of tightly scripted activities if students are required to prepare, make decisions, analyze uncertainty, communicate results, and respond to feedback. Current laboratory scholarship supports this move from procedural completion toward coherent learning design (Seery et al., 2024; Lo & Greenberg, 2026).

Third, chemistry should participate in longitudinal curriculum integration. Students can revisit the same chemical ideas at increasing levels of biomedical complexity: an acid-base equilibrium first as a chemical system, later as a physiological buffer, and later still as part of interpretation of a clinical disturbance. Such revisiting can strengthen retrieval and causal understanding while signaling that foundational science remains relevant beyond the first year. The broader medical-education literature supports integration across time rather than one-directional transfer from a preclinical block to later clinical study (Brauer & Ferguson, 2015; Bandiera et al., 2018).

13. Limitations and research agenda

This review has several limitations. First, it is a targeted narrative synthesis rather than a systematic review, so it does not estimate effect sizes or claim exhaustive coverage of the literature. Second, much chemistry-education evidence comes from chemistry majors or general undergraduate STEM populations rather than medical or pharmacy students, so transfer to health-professions contexts should be tested rather than assumed. Third, the CEPC framework is a conceptual model derived from the literature synthesis and the integrative logic developed in this review; it has not yet undergone empirical validation. Fourth, acmeology is more prominent in post-Soviet pedagogical traditions than in contemporary international medical-education research, so its contribution here is interpretive and should not be treated as an independently validated mechanism.

These limitations define a clear research agenda. Future studies should operationalize individual CEPC pathways, develop valid performance measures, and test whether clinically contextualized chemistry activities improve not only course achievement but also transfer to later biomedical reasoning. Longitudinal designs would be especially valuable because the central claim concerns professional development over time. Comparative studies could also examine whether competency-aligned laboratories produce stronger gains in data reasoning, communication, or self-regulation than traditional expository formats.

14. Conclusion

Chemistry can make a meaningful contribution to professional competence in medical higher education, but that contribution does not occur automatically from exposure to chemical content. Its value becomes visible when chemical concepts are connected to clinically relevant mechanisms, laboratory work is designed around authentic scientific practices, students actively solve and explain problems, professional skills are deliberately assessed, and reflection turns feedback and error into improved performance.

The proposed CEPC framework brings these functions together in five pathways: conceptual-clinical integration; experimental-research competence; analytical problem solving and evidence use; communication, collaboration, and information management; and reflective self-regulation and professional growth. The framework also makes explicit the conditions that support those pathways: authentic context, active learning, scaffolding, feedback, constructive alignment, and safe practice. Used in this way, chemistry is not merely an early prerequisite for medicine or pharmacy. It becomes a strategically designed component of a longitudinal professional curriculum that helps students learn how to reason from mechanisms, work with evidence, communicate responsibly, and continue improving as future health professionals.

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IMPROVING SOFTWARE FOR ASSESSING AND DEVELOPING STUDENTS' DESIGN COMPETENCE BASED ON DIGITAL IDENTIFICATION AND MONITORING TECHNOLOGIES

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Annotatsiya. *Maqolada bo‘lajak informatika o‘qituvchilarining loyihalash-konstruktorlik kompetentligini rivojlantirishda raqamli identifikasiya texnologiyalari (Face-ID, QR-Code Scanner, GPS-monitoring) va takomillashtirilgan dasturiy ta'minotning o‘rni tadqiq etilgan. Muallif tomonidan ta'lim jarayonida «intellektual reinjiniring» va «tizimli arxitektor» konsepsiyalari asoslab berilgan. Tadqiqot natijalari shuni ko‘rsatadiki, ma'muriy yuklamalarni avtomatlashtirish hisobiga o‘qituvchining 20% vaqt resursi tejaladi va bu ko‘rsatkich akademik o‘zlashtirishni 15-17% ga oshirishga xizmat qiladi. Maqolada xalqaro “Digital Twin” va “Digital Fluency” modellari qiyosiy tahlil qilinib, milliy ta'lim tizimi uchun “Tizimli integrasiya” modeli taklif etilgan.*

Kalit so‘zlar: *raqamli identifikasiya, intellektual reinjiniring, tizimli arxitektor, ETU koeffisienti, loyihalash kompetentligi, Face-ID, QR-Code Scanner, GPS-monitoring, ta'lim sifati, raqamli ekotizim.*

Аннотация. *В статье исследуется роль технологий цифровой идентификации (Face-ID, QR-Code Scanner, GPS-мониторинг) и усовершенствованного программного обеспечения в развитии проектно-конструкторской компетентности будущих учителей информатики. Автором обоснованы концепции «интеллектуального реинжиниринга» и «системного архитектора» в образовательном процессе. Результаты исследования показывают, что за счет автоматизации административной нагрузки высвобождается 20% временного ресурса преподавателя, что способствует росту академической успеваемости на 15-17%. В работе проведен сравнительный анализ международных моделей “Digital Twin” и “Digital Fluency”, на основе которых предложена модель «Системной интеграции» для национальной системы образования.*

Ключевые слова: *цифровая идентификация, интеллектуальный реинжиниринг, системный архитектор, коэффициент ETU, проектная компетентность, Face-ID, QR-Code Scanner, GPS Monitoring качество образования, цифровая экосистема.*

Abstract. *The article examines the role of digital identification technologies (Face-ID, QR-Code Scanner, GPS-monitoring) and enhanced software in developing the design and engineering competence of future informatics teachers. The author substantiates the concepts of “intellectual reengineering” and "system architect" within the educational process. Research results indicate that automating administrative workloads saves 20% of the instructor's time resources, which contributes to a 15-17% increase in academic performance. The paper provides a comparative analysis of international models such as “Digital Twin” and “Digital Fluency,” proposing a “System Integration” model tailored for the national education system.*

Keywords: *digital identification, intellectual reengineering, system architect, ETU coefficient, design competence, Face-ID, QR-Code Scanner, GPS-monitoring, quality of education, digital ecosystem.*

I. Introduction

The tasks set out in the Decree of the President of the Republic of Uzbekistan No. PF-150 [1] require the digital transformation of the higher education system and the advancement of professional training of future specialists to a new level. As noted in our previous studies [2], digital monitoring is not only a control tool, but also an integral part of the design of the educational environment. In this process, the scientific research of M.E. Mamarajabov [3] serves as an important methodological basis for developing the design competence and culture of future computer science teachers.

Also, the theoretical foundations of computerization of the educational process [4] and issues of developing digital competence of future teachers [5] form the basis of the research. The comparative analysis examined international experiences, including the German "Digital Twin" concept [7], the English "Digital Fluency" and professional standards [8]. Based on the RAIL model [6] of monitoring students in digital ecosystems, priority areas of the "System Integration" model for Uzbekistan were identified.

II. Research methodology and mathematical foundations

The digital identification system (Face-ID, QR-check and GPS monitoring) allows for the optimization of the administrative workload. We evaluated the overall balance of lesson time use using the following mathematical expression:

$$T_{totol} = T_{adm} + T_{inst} + T_{res}$$

Here:

T_{adm} – administrative-organizational workload time;

T_{inst}- purely didactic (teaching) time;

T_{res}- creative-project reserve time.

After the system was implemented, a proportional increase in T_{inst} and T_{res} was observed due to a decrease in ΔT_{adm}.

The relationship between the increase in the quality of education (Q_{edu}) and the time utilization coefficient (ETU) is expressed as follows:

$$Q_{edu} = f(EDU \times M_P)$$

Here M_p is the level of technological synthesis in the pedagogical skill and the "master-apprentice" system. That is, the digital system saves time, and the "master-apprentice" system converts this time into high-quality educational content.

III. Results and histogram analysis

As a result of experimental work, didactic time efficiency in innovative groups increased from 75% to 97%. Statistical data showed that the level of student mastery in groups where digital monitoring was used increased by 17%. While 15–20 minutes were spent on organizational work in the traditional method, this indicator was 2–3 minutes in the digital system. Comparative indicators of traditional and innovative educational groups (Table 1).

Table 1

Values and efficiency determined by indicators in traditional and innovative groups

№	Indicators	Traditional group	Innovative group (Digital monitoring)	Difference (Efficiency)
1	Level of mastery	68%	85%	+17%
2	Didactic time productivity K_{de}	75%	97%	+22%
3	Time spent on administrative tasks	15–20 minute	2–3 minute	~15-17 saves minutes
4	Quality of project assignments	Average	High	Significant growth
5	Number of independent projects	2	5	+150%

As can be seen from the table, the introduction of the digital identification system has significantly reduced the administrative burden, increasing the net learning time. In particular, the mastery rate of 68% in the traditional group increased to 85% in the innovative group, which is explained by the fact that the saved time was properly directed to project and individual work.

Statistical data showed that in groups where digital monitoring was used, the level of student mastery increased from 68% to 85% in traditional groups, and didactic time efficiency increased from 75% to 97% (Figure 1). This **17%** increase is explained by the expansion of individual work and project-based learning due to the saved time. While in the traditional method, about 15-20 minutes (**up to 25%**) of an 80-minute lesson is spent on organizational work, in the digital identification system this figure is 2-3 minutes (Figure 2).

As a result, **20% of additional** time is saved. While the number of independent projects in traditional groups was 2, it can be seen that in innovative groups, the number of independent projects completed by students during the saved time increased to 5 (Figure 3).

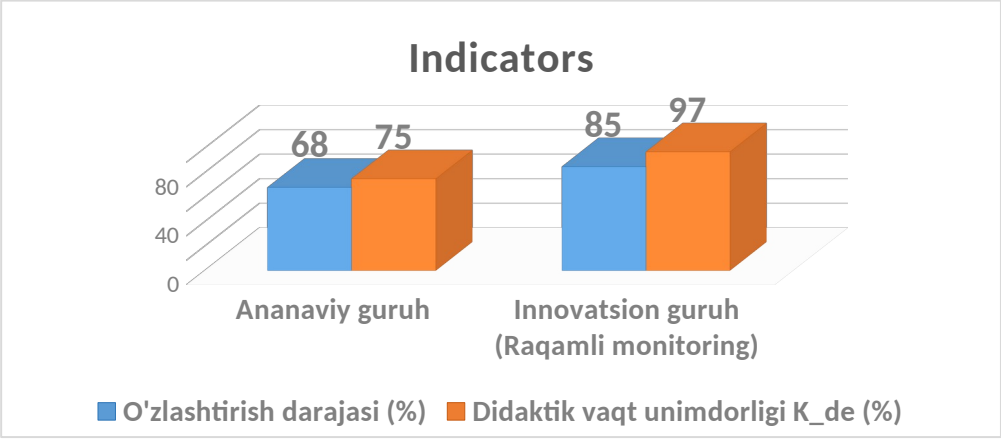


Figure 1. Level of mastery and level of didactic time productivity

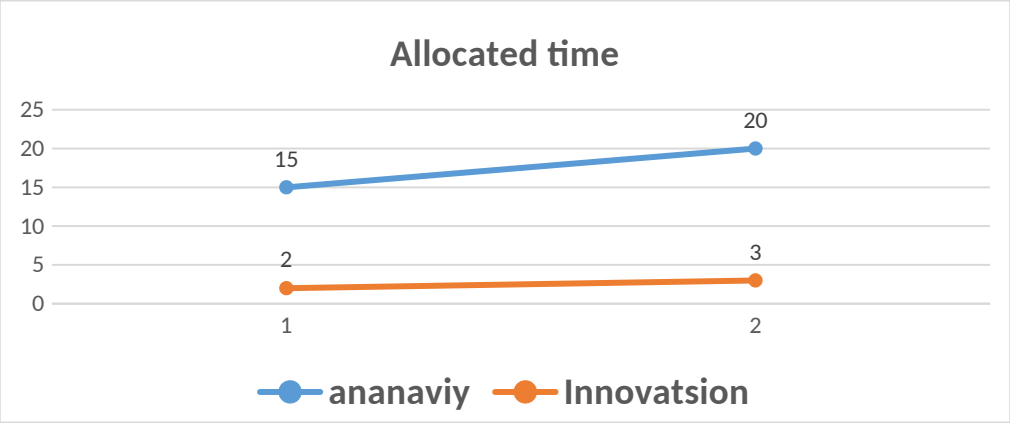


Figure 2. Time spent on administrative tasks

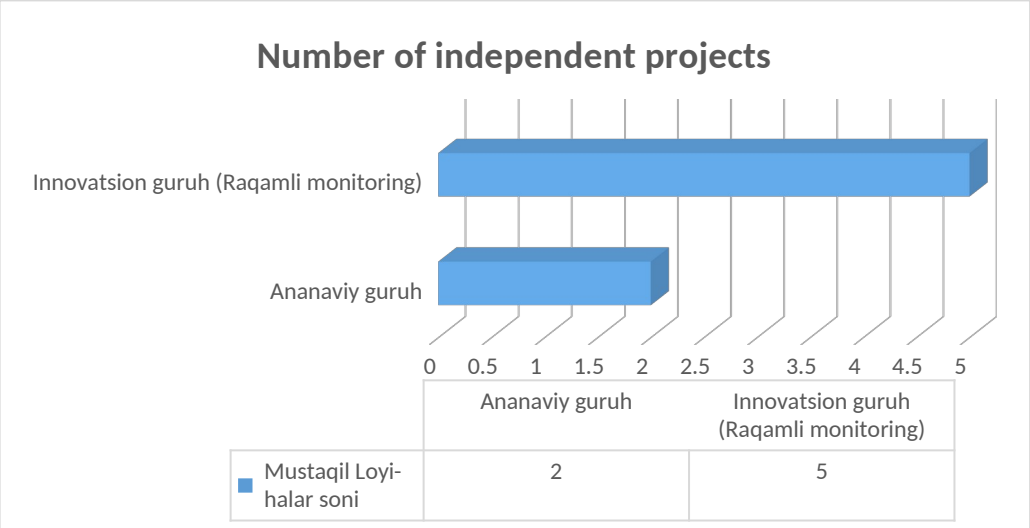


Figure 3. Number of independent projects

The results of the experimental study demonstrated that, compared to the control groups operating under traditional forms of education, the effectiveness of the learning process was significantly higher in the innovative groups where digital monitoring technologies were implemented. The analysis of the obtained results confirmed the superiority of the innovative groups across all key indicators. This finding indicates that an educational process organized on the basis of digital monitoring is an important factor in improving students' achievement levels, engagement, and overall learning effectiveness (Figure 4).

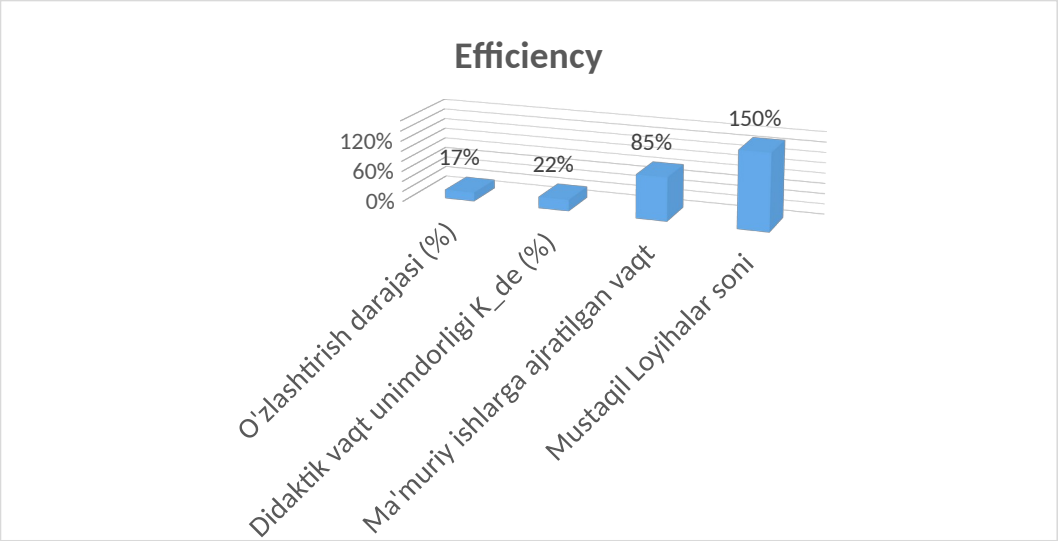


Figure 4. Efficiency indicator

The conceptual advantage of the proposed system within the framework of the research is manifested in the mutual synthesis of traditional pedagogical skills and modern digital capabilities. As a result of improving the software and introducing digital identification tools, the following scientific and practical results were achieved:

Optimization (transformation) of the administrative burden: The implementation of a digital control system (Face-ID, QR-Code Scanner, GPS-monitoring) has freed educators from the burden of passive control and routine attendance recording. This process has allowed the digital transformation of administrative tasks to create a resource of "creative time" for purely didactic communication in the educational process.

Systemic transformation of the status of the educator: The professional activity of the future computer science teacher has been transformed from a traditional operator to a "system architect" who designs the educational environment. This approach serves to minimize the human factor in assessing the design competence of future specialists.

Comparative analysis and integration of international models: Based on a comparative analysis of international experiences, including the German "Digital Twin", the UK's "Digital Fluency", and the Russian "Algorithmic Design" models, priority areas of the "System Integration" model for the higher education system of Uzbekistan were identified.

V. CONCLUSION

As a result of the research and empirical analysis, the following scientific conclusions were drawn regarding the development of design and construction competence of future computer science teachers in the context of digital transformation of the educational process:

1. The integration of digital identification (Face-ID, QR-Code Scanner, GPS-monitoring) and improved software in the educational environment is not only a technical upgrade, but also a fundamental restructuring of pedagogical processes - the phenomenon of "intellectual reengineering". In this case, the content of the teacher's activity is transformed from an operational workload to a creative-design direction due to the transfer of traditional control functions to algorithmic systems.

2. The proposed ETU (Educational Technology Utility) coefficient proved to be an important indicator measuring the impact of digital identification technologies on the quality of education. The **20% time** resource gained as a result of the automation of administrative and

organizational workloads serves to accelerate the independent design activities of students. This, in turn, ensures a statistically significant increase in academic achievement indicators by **15-17%**.

3. The role of the future computer science teacher in the digital ecosystem has been justified as a transition from an "information re-translator" to a "system architect". The results of the study show that the use of digital twins and algorithmic design models in assessing students' design competence in "minimizing the human factor" and monitoring the process provides high methodological effectiveness.

4. The digital interpretation of the "master-apprentice" model has emerged as a strategic tool to bridge the technological gap between generations. The national "System Integration" model, developed based on a comparative analysis of the German "Digital Twin" and the English "Digital Fluency" models, can allow the development of a digital environment in higher education institutions based on human values and traditional schools.

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DEVELOPING STUDENTS' ENGLISH SPEAKING COMPETENCE THROUGH ARTIFICIAL INTELLIGENCE TECHNOLOGIES

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Abstract. *This article examines the development of students' English speaking competence through artificial intelligence technologies. It focuses on AI voice chatbots, automatic speech recognition, automated feedback, and adaptive speaking tasks. The article argues that AI is most effective when it is used as a supportive tool within teacher-guided, communicative, and ethically responsible instruction.*

Keywords: artificial intelligence, speaking competence, English language teaching, AI chatbot, automatic speech recognition, feedback.

INTRODUCTION

Developing English speaking competence is a central goal of modern foreign language education. Many students know grammatical rules and basic vocabulary, but they still have difficulty expressing ideas orally, pronouncing words clearly, participating in discussions, and responding spontaneously. These problems are especially common in EFL contexts where students have limited contact with authentic English outside the classroom. A further challenge is that teachers cannot provide long individual speaking practice and detailed feedback to every learner during one lesson. Artificial intelligence technologies offer new possibilities for overcoming these difficulties. Voice chatbots can simulate dialogue partners, automatic speech recognition can transcribe learner speech, and speech evaluation programs can provide feedback on pronunciation, fluency, rhythm, grammar, and vocabulary. Adaptive platforms can also adjust tasks to students' levels and learning goals. As a result, students can practise more often, receive immediate correction, and work on their weaknesses without fear of public mistakes.

However, AI should not be understood as a replacement for the teacher. Speaking competence includes not only pronunciation and fluency, but also discourse organization, sociolinguistic appropriateness, interactional strategies, and the ability to communicate meaningfully with other people. These aspects require human guidance, peer interaction, cultural awareness, and ethical assessment. Therefore, the purpose of this article is to analyze how AI technologies can support students' English speaking competence within a blended teaching model based on the IMRAD structure.

LITERATURE REVIEW AND METHODOLOGY

Recent literature on AI in education emphasizes a human-centered and pedagogically justified approach. UNESCO guidance documents stress that AI can support innovation in teaching and learning, but its use should protect privacy, inclusion, equity, and human agency. This is particularly important in speaking instruction because voice recordings may contain sensitive personal data. For this reason, teachers should choose reliable tools, explain the purpose of AI tasks, and avoid using automated scores as the only form of assessment. Studies on automatic speech recognition show that ASR can support pronunciation and speaking development by giving

learners immediate and objective feedback. When students see that a system does not recognize a word clearly, they begin to notice pronunciation problems and repeat the item more carefully. This noticing process is useful because learners often do not hear their own errors. ASR-based activities are especially helpful for individual practice, self-correction, and preparation before classroom speaking. AI voice chatbots also have strong pedagogical potential. They allow students to practise situational dialogues, interviews, role-plays, travel conversations, academic discussions, and professional communication. The advantage of a chatbot is that it gives each learner equal speaking time and creates a low-pressure environment. Students who are shy in class can first practise privately and then participate more confidently in peer or group interaction.

Automated speech evaluation programs can analyze pronunciation, stress, pauses, speech rate, and lexical range. Their feedback is not perfect, but it can serve as the first stage of correction. The teacher can then focus on deeper communicative aspects such as coherence, argumentation, relevance, pragmatics, and interaction. Thus, AI feedback and teacher feedback should be combined rather than opposed. The theoretical foundation of this article is based on communicative language teaching, task-based learning, sociocultural theory, and the interactionist view of second language acquisition. Speaking develops when learners use language for meaningful purposes, receive feedback, modify their output, and communicate with others. AI technologies can support these principles if tasks are carefully designed by the teacher.

Methodologically, the article uses qualitative analysis and pedagogical modeling. Recent studies on AI-supported speaking instruction were reviewed according to four criteria: the type of AI tool, the speaking sub-skill supported by the tool, the form of feedback, and the role of the teacher. On this basis, a practical model for university English classes was developed. The model may be applied during an eight-week module: students complete a diagnostic speaking task, practise with AI tools two or three times a week, collect feedback in a portfolio, and perform final speaking tasks assessed by a competence-based rubric.

Table 1. AI technologies and their pedagogical functions in speaking instruction

AI tool	Main function	Speaking outcome	Teacher role
Voice chatbot	Dialogue and role-play	Fluency and confidence	Select scenarios
ASR system	Transcription and error noticing	Pronunciation awareness	Explain errors
Speech evaluator	Automated feedback	Accuracy and rhythm	Validate scores
Adaptive platform	Personalized tasks	Autonomy and motivation	Differentiate learning

RESULTS AND DISCUSSION

The analysis indicates that AI technologies can improve English speaking competence in several interconnected directions. The first result is increased speaking practice time. In a traditional classroom, each learner may speak only for a short period, especially in large groups. With an AI chatbot or speaking platform, students can practise individually, repeat the same task several times, and compare their earlier and later versions. This repeated oral production is important for fluency because learners become faster and more confident in retrieving language.

The second result is improvement in pronunciation and intelligibility. ASR and speech evaluation tools can identify words or phrases that are unclear and can encourage students to repeat them. The system may not always be fully accurate, but it gives learners a signal that their

pronunciation needs attention. When this signal is followed by teacher explanation and targeted practice, students can improve stress, rhythm, final consonants, and connected speech.

The third result is reduction of speaking anxiety. Many students avoid speaking because they are afraid of making mistakes in front of others. AI provides a private and low-pressure space where learners can practise before public performance. This is not a substitute for real communication, but it is a useful preparatory stage. Students who first practise with AI often become more willing to speak in pairs, groups, and presentations.

The fourth result is the growth of learner autonomy. AI platforms can show transcripts, pronunciation indicators, vocabulary suggestions, speaking time, and progress data. When students learn to interpret this feedback, they become more responsible for their own improvement. A speaking portfolio can strengthen autonomy because learners collect evidence, write reflections, and set personal goals for the next task.

The fifth result is more differentiated instruction. Students in one group usually have different levels of vocabulary, grammar, pronunciation, and confidence. AI tools can offer easier tasks for weaker students and more complex tasks for advanced students. The teacher can also use common errors from AI practice to plan mini-lessons. In this way, AI helps the teacher make instruction more targeted and individualized. The following colorful scheme presents the proposed cycle. It begins with needs analysis, continues through AI practice and instant feedback, and finishes with correction, classroom interaction, and assessment. The cycle should be repeated throughout the module so that students gradually improve their speaking competence through practice, feedback, and reflection.

AI-Supported Model for English Speaking Competence

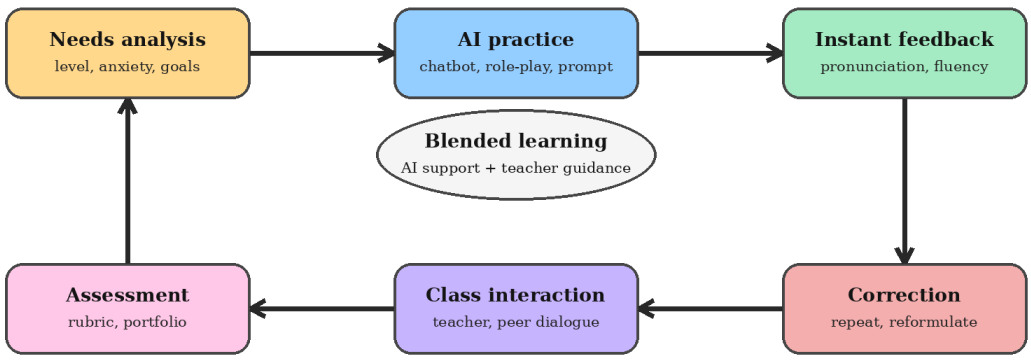


Figure 1. AI-supported cycle for developing English speaking competence

Despite these advantages, AI-supported speaking instruction has several limitations. Automated feedback may be inaccurate when students have strong accents, when the recording quality is low, or when background noise is present. Some systems may evaluate pronunciation mechanically and ignore the communicative value of the message. Therefore, AI scores should be treated as supportive evidence, not as final judgment. Human assessment remains necessary for meaning, coherence, pragmatics, and interaction. Another limitation is the risk of passive dependence on AI. If students only read or repeat ready-made answers produced by a chatbot, their own speaking competence will not develop sufficiently. To avoid this, tasks should require

students to speak first, analyze AI feedback, revise their own speech, and then perform the improved version in class. The main learning process is not receiving a perfect answer, but improving one's own oral output.

A practical classroom model may include three stages. In the pre-speaking stage, the teacher introduces the topic, vocabulary, pronunciation focus, and communicative goal. In the AI-speaking stage, students practise individually with a chatbot or ASR tool and save feedback. In the post-speaking stage, students use the improved language in pair work, group discussion, presentation, or debate. This structure connects technology with real communication. Assessment should be competence-based and balanced. A useful rubric may include pronunciation, fluency, grammatical accuracy, vocabulary range, coherence, and interactional strategies. AI tools can support assessment of pronunciation and fluency, while teachers and peers are needed for discourse, content, and social interaction. The final evaluation should combine AI evidence, teacher observation, peer feedback, and student reflection.

The pedagogical implication is that AI technologies are most effective when they are systematic, purposeful, and integrated with communicative tasks. Occasional use may motivate learners, but regular use within a clear methodology can produce deeper results. The strongest model is not AI instead of the teacher, but AI together with the teacher: technology provides practice and feedback, while the teacher provides meaning, ethics, and methodological direction.

CONCLUSION

Artificial intelligence technologies can make an important contribution to the development of students' English speaking competence. Voice chatbots, automatic speech recognition, automated speech evaluation, and adaptive platforms increase practice time, provide immediate feedback, reduce anxiety, support autonomy, and help teachers differentiate instruction. These opportunities are especially valuable in EFL contexts where students need more oral practice and more individualized correction.

At the same time, AI must be used responsibly. It cannot replace teacher judgment, peer interaction, cultural appropriateness, or ethical control. The most effective approach is a blended model in which AI-supported individual practice is followed by teacher-led communication and competence-based assessment. Future studies should examine long-term effects, data privacy, accessibility, and the reliability of automated feedback for learners with different accents.

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AN EVIDENCE-INFORMED DIGITAL-TECHNOLOGY-MEDIATED MODEL AND METHODOLOGICAL SYSTEM FOR DEVELOPING LANGUAGE ASPECTS OF PRE-SERVICE FOREIGN LANGUAGE TEACHERS

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Abstract. *The development of foreign language competence among pre-service teachers requires systematic attention to phonetic, lexical, grammatical, and communicative aspects of language, while also accounting for their emerging professional identity as future language educators. Although digital technologies have demonstrated potential for supporting individual language-learning outcomes, existing research has predominantly focused on general language learners, individual skills, or broad forms of digital and professional competence. This study addresses this gap by proposing an evidence-informed theoretical model and corresponding methodological system for developing four language aspects of pre-service foreign language teachers through digital technologies and by illustrating its implementation in the prototype LangMaster AI platform. The study adopts a design-based literature-synthesis approach grounded primarily in the Technological Pedagogical Content Knowledge (TPACK) framework and Vygotsky’s Zone of Proximal Development (ZPD). Recent meta-analyses and systematic reviews were used to inform the selection of aspect-specific digital methods, including computer-assisted pronunciation training and automatic speech recognition for phonetic development, spaced practice and mobile-assisted learning for vocabulary development, gamified digital practice for grammar development, and flipped-classroom-based communicative activities for communicative development. The resulting framework consists of five interrelated blocks: goal-task, content, technological-methodological, assessment-outcome, and reflective-corrective. These blocks are operationalized through a five-stage instructional cycle involving diagnosis, explanation, adaptive practice, reflection, and re-diagnosis. LangMaster AI provides a prototype digital instantiation through a three-phase architecture comprising pre-test diagnosis, adaptive intervention, and post-test assessment. The proposed framework is a testable theoretical and methodological design rather than an empirically validated intervention. Its effectiveness will require subsequent quasi-experimental investigation involving pre-service foreign language teachers.*

Keywords: *pre-service foreign language teachers; digital language pedagogy; language aspects; adaptive learning; artificial intelligence; TPACK; computer-assisted language learning; LangMaster AI.*

Introduction. Digital transformation has increasingly influenced foreign language education across educational levels, including higher education and teacher education. Computer-assisted and mobile-assisted interventions have demonstrated potential for improving specific dimensions of language learning, including pronunciation, vocabulary, grammar, speaking, and communicative competence. Meta-analytic evidence has reported positive effects of computer-

assisted pronunciation training (Mahdi & Al Khateeb, 2019), technology-mediated pronunciation training using automatic speech recognition (Ngo et al., 2024), spaced practice for second-language vocabulary learning (Kim & Webb, 2022), mobile-assisted vocabulary learning (Zhou & Zhou, 2025), gamification in educational settings (Li et al., 2023), and flipped-classroom approaches in second-language learning (Vitta & Al-Hoorie, 2023). However, a substantial proportion of this evidence concerns general language learners rather than pre-service foreign language teachers.

This distinction is theoretically and methodologically important. A pre-service foreign language teacher is not only a language learner but also a developing professional who must ultimately use the target language as a pedagogical instrument. Consequently, the development of language competence in this population involves both linguistic improvement and the gradual formation of professionally oriented language use. Evidence from teacher-education research further suggests that blended and flipped forms of instruction can improve learning outcomes while also supporting teacher self-efficacy (Schmid et al., 2023).

The reviewed literature indicates a relative lack of comprehensive, aspect-specific methodological frameworks designed specifically for pre-service foreign language teachers. Existing studies have predominantly examined individual language skills, general digital language learning, blended or flipped instruction, gamification, or broader professional and digital competencies. Comparatively less attention has been given to an integrated architecture in which phonetic, lexical, grammatical, and communicative development are treated as distinct but interrelated components and linked to evidence-informed digital methods within a single adaptive instructional system.

The Uzbek research context provides a complementary basis for addressing this problem. Recent doctoral research has examined different dimensions of digital transformation in English-language teacher education. Yusupova (2023), for example, investigated blended educational technologies in accelerated English-language teaching, whereas Abilova (2026) developed a model for improving the professional competencies of secondary-school English teachers under digital-education conditions. Makhsudova (2025) focused specifically on the development of practical phonetic skills among future foreign language teachers. These studies demonstrate the relevance of structured digital interventions in the Uzbek educational context. Nevertheless, the reviewed works do not provide an integrated methodological architecture that simultaneously addresses phonetic, lexical, grammatical, and communicative development among pre-service foreign language teachers.

The present study therefore has three objectives. First, it proposes a theoretical model for developing the four language aspects of pre-service foreign language teachers through digital technologies. Second, it derives from this model a methodological system that specifies aspect-specific methods, organizational forms, instructional stages, and assessment mechanisms. Third, it illustrates the digital instantiation of this system through the prototype LangMaster AI platform, which is designed to support future empirical validation.

The contribution of the proposed framework is fourfold. First, it conceptualizes language development through four distinct but interconnected language-aspect subsystems. Second, it links each subsystem to an evidence-informed digital method rather than applying a single technology uniformly across instructional objectives. Third, it introduces a diagnostic-adaptive instructional cycle in which learner performance informs subsequent instructional decisions. Fourth, it

incorporates reflective and corrective mechanisms connecting assessment, learner self-evaluation, and subsequent methodological adjustment.

Materials and Methods. *Research design.* The study follows a design-based literature-synthesis approach rather than an empirical experimental design. No learner outcome data were collected at this stage. The primary outcome of the study is therefore a theoretically grounded methodological framework and its prototype digital instantiation rather than an experimentally established effect of the proposed intervention.

The development process consisted of three interconnected stages: theoretical grounding, evidence synthesis, and model-system construction. The resulting framework was subsequently instantiated in the prototype LangMaster AI platform in order to make its methodological assumptions operational and testable in a future empirical study.

Theoretical grounding. Two principal theoretical perspectives informed the construction of the framework. The first is the Technological Pedagogical Content Knowledge (TPACK) framework developed by Mishra and Koehler (2006) and subsequently examined critically in the context of language teaching by Tseng et al. (2022). TPACK was used to ensure that technology selection was subordinated to pedagogical purposes and language-content requirements rather than treated as an instructional objective in itself. Within the proposed framework, each digital technology is therefore selected according to the specific linguistic and pedagogical function it is expected to perform.

The second theoretical foundation is Vygotsky's (1978) concept of the Zone of Proximal Development (ZPD). In the proposed system, the ZPD perspective informs the staged and diagnostic nature of instruction. Learners first undergo diagnostic assessment, after which subsequent practice is adapted according to their identified needs and level of readiness. The framework consequently treats digital adaptation as a mechanism for supporting progression from assisted to increasingly independent performance.

The methodological treatment of the digital platform was also informed by Mamatov's (2017) work on pedagogical design in electronic information-educational environments. This perspective supports the treatment of the digital platform not merely as an auxiliary technological tool but as an integral component of the instructional design.

Evidence synthesis. Evidence informing the selection of methods was derived from recent meta-analyses and systematic reviews published primarily during the 2019–2025 period. Priority was given to peer-reviewed studies that examined technology-mediated language learning and reported quantitative evidence, including Cohen's d, Hedges' g, or comparable effect estimates. Where available, evidence involving pre-service or in-service teachers was prioritized. Where population-specific evidence was limited, high-quality evidence from broader language-learning populations was retained as indirect methodological support rather than as direct evidence of effectiveness among pre-service teachers.

The evidence synthesis was organized according to the four target language aspects: phonetic, lexical, grammatical, and communicative. For each aspect, the relevant evidence was examined to identify digital methods with sufficient empirical support to justify their inclusion in the proposed methodological system.

The synthesized evidence was used for methodological selection rather than as evidence that the integrated LangMaster AI intervention itself is effective. Consequently, the effect sizes reported in the Results section represent findings from previous research and should not be interpreted as outcomes generated by the present study.

Model and methodological system construction. The theoretical model was constructed by organizing the identified goals, language content, technological-methodological choices, and assessment mechanisms into interrelated functional blocks. The methodological system was subsequently derived by translating these blocks into aspect-specific instructional methods, organizational forms, adaptive procedures, and stages of implementation.

The construction process was guided by the principle that digital technology should perform a pedagogically defined function. Accordingly, the proposed system does not assume that a single technology is equally appropriate for all language aspects. Instead, different digital methods are associated with different linguistic objectives, while diagnostic and reflective mechanisms connect the components into a unified instructional cycle.

Results. The five-block theoretical model**:** the proposed theoretical model consists of five interrelated functional blocks.

The **goal-task block** defines the strategic objective of developing phonetic, lexical, grammatical, and communicative competence in pre-service foreign language teachers and translates this objective into specific instructional tasks.

The **content block** organizes the instructional material according to the four language aspects. This organization allows each aspect to be addressed explicitly while preserving its relationship with the broader language system.

The **technological-methodological block** connects each language aspect with an evidence-informed digital method. The central principle of this block is methodological matching: the technology is selected according to the linguistic objective and pedagogical function.

The **assessment-outcome block** defines the diagnostic criteria and instruments used to identify learners' initial profiles and monitor developmental changes.

The **reflective-corrective block** connects assessment outcomes with subsequent instructional decisions. In this way, the model operates cyclically rather than as a fixed linear sequence. Assessment information can re-enter the instructional process and influence subsequent goals, tasks, and practice.

The five blocks can therefore be conceptualized as a feedback-oriented system: Goal and task → Content → Technological-methodological implementation → Assessment of outcomes → Reflection and correction → revised instructional decisions

This cyclical structure is intended to support individualized development rather than a single uniform sequence of instruction.

Evidence-informed selection of aspect-specific methods. The findings presented in this section represent evidence informing the design of the proposed methodological system rather than empirical results generated by the present study.

Phonetic aspect. Computer-assisted pronunciation training (CAPT) and automatic speech recognition (ASR)-supported pronunciation practice were selected as complementary methods for phonetic development. Mahdi and Al Khateeb's (2019) meta-analysis of 20 studies involving 1,014 participants reported a moderate-to-large effect of CAPT on pronunciation accuracy ($d = 0.68$), with stronger effects among beginner and intermediate learners. More recent meta-analytic evidence by Ngo et al. (2024) indicates that ASR-based pronunciation training can be particularly useful for segmental accuracy and that explicit feedback formats are associated with stronger outcomes.

Regional evidence provides additional support for the relevance of technology-mediated phonetic training among the target population. Makhsudova (2025), in a quasi-experimental study

involving 305 pre-service foreign language teachers at three Uzbek pedagogical universities, reported a statistically confirmed 14% overall improvement associated with podcasting-, videocasting-, and gamification-based practical phonetic training compared with traditionally taught instruction.

Within the proposed system, these findings support the use of digital pronunciation practice, speech recording, automated or technology-assisted feedback, and repeated pronunciation attempts. Their integration into LangMaster AI is intended to provide learners with opportunities for individualized phonetic practice and formative feedback.

Lexical aspect. Spaced or distributed practice was identified as the principal methodological approach for lexical development. Kim and Webb's (2022) meta-analysis of 48 experiments, comprising 98 effect sizes and 3,411 participants, reported a large effect of spaced practice on delayed vocabulary retention (g = 1.15) compared with massed practice.

Further support comes from Zhou and Zhou (2025), whose Bayesian meta-analysis of 65 studies found a large effect for mobile-assisted vocabulary learning, with an overall effect estimate of g = 1.28 for interventions involving mobile applications and sustained practice. These findings suggest that both distribution of practice and mobile delivery can contribute to lexical development.

In the proposed methodological system, spaced practice is therefore combined with learner-specific diagnostic information. Rather than presenting vocabulary items exclusively according to a fixed sequence, the platform is intended to use learner performance to determine which lexical items or categories require additional practice and repetition.

Grammatical aspect. Gamified digital exercises were selected as the principal method for grammatical development. Li et al. (2023) reported a large overall effect of gamification in educational settings (g = 0.822; 41 studies; more than 5,071 participants). A language-specific meta-analysis conducted in the South Korean context by Lee and Baek (2023) reported a smaller but statistically significant effect on English-language proficiency (g = 0.517; 11 studies; 610 participants).

At the same time, the evidence concerning the duration of gamified interventions is not uniform. Kim and Castelli (2021) reported stronger effects for brief interventions, with effect estimates declining as intervention duration increased, whereas Li et al. (2023) found stronger outcomes for interventions lasting longer than one semester. This inconsistency suggests that duration and intensity should not be treated as universal fixed parameters.

Accordingly, the proposed system treats gamification duration and intensity as implementation parameters to be monitored and empirically examined. The system can incorporate digital grammar exercises, levels, immediate feedback, progress indicators, and task-based challenges, while the optimal duration remains an empirical question for future validation.

Regional research also supports the treatment of grammatical competence as an identifiable component of language development. O'tayeva (2022) examined the development of grammatical competence through independent learning, providing complementary support for the treatment of grammar as an explicitly trainable aspect rather than merely a by-product of general language exposure.

Communicative aspect. A flipped-classroom approach combining independent preparation with guided communicative practice was selected for the communicative aspect. Vitta and Al-Hoorie's (2023) meta-analysis of 56 studies involving 4,220 participants reported a large effect of

flipped-classroom approaches in second-language learning (g = 0.99), with a publication-bias-adjusted estimate of g = 0.58.

For pre-service foreign language teachers, however, communicative development should extend beyond general speaking practice. It should also include professionally situated language use, such as explaining language material, giving classroom instructions, responding to pedagogical situations, providing formative feedback, participating in microteaching activities, and managing teacher–student interaction.

This professional orientation is particularly important because the target population occupies a dual role: they are language learners and future language educators. The proposed system therefore incorporates communicative tasks that connect language production with emerging professional-pedagogical functions.

A systematic review by Chan and Lo (2024) further indicates that professional-pedagogical communicative situations remain comparatively under-represented in gamification research, supporting the need for communicative activities specifically designed around teacher-oriented situations.

Formative self-assessment as a cross-cutting mechanism. Formative, learner-initiated self-assessment is incorporated across all four language aspects. A systematic review by Lee et al. (2020), based on 33 K–12 studies and 126 effect sizes, reported an overall moderate effect of formative assessment (d = 0.29), while student-initiated self-assessment demonstrated the strongest effect among the coded features (d = 0.61).

In the proposed system, self-assessment is not treated as a separate language aspect. Instead, it functions as a cross-cutting reflective mechanism through which learners evaluate their own performance and contribute to the identification of subsequent learning needs.

The five-stage instructional cycle. The methodological system operationalizes the theoretical model through a five-stage instructional cycle:

Stage 1 — Digital diagnosis. Learners complete a baseline diagnostic assessment covering the four language aspects. The purpose is to establish an individual performance profile rather than simply assign an overall proficiency level.

Stage 2 — Brief theoretical and methodological orientation. The instructor provides concise explanations related to the diagnosed area of difficulty and, where appropriate, demonstrates the pedagogical purpose of the selected digital method.

Stage 3 — Adaptive digital practice. Learners engage in digital activities selected according to their diagnostic profile. Adaptation refers to the use of diagnostic information to influence the subsequent aspect, topic, task type, and level of practice rather than simply providing access to a collection of digital exercises.

Stage 4 — Reflection and professional analysis. Learners examine their own performance and reflect not only on what they have learned but also on how the digital method could potentially be used in their future teaching practice.

Stage 5 — Delayed re-diagnosis. Learners complete subsequent diagnostic activities to identify developmental changes and provide information for further instructional decisions.

Individual, paired, and whole-class organizational forms are retained but digitally reconfigured. Individual work is supported through platform-based diagnosis and adaptive practice, while whole-class work can involve instructor-facilitated analysis of aggregated platform-generated performance data.

Adaptive decision-making mechanism. The adaptive component of the proposed system is defined through the relationship between diagnostic performance and subsequent instructional selection.

The process can be represented as: Diagnostic performance → individual language profile → identification of priority aspect → task selection → feedback → performance monitoring → re-diagnosis → updated profile

Under this logic, a learner's weaker performance in a particular aspect results in greater instructional attention to that aspect, whereas stronger performance permits progression toward more complex or less-supported tasks. The precise thresholds and decision rules should be established and empirically validated during the subsequent experimental stage rather than treated as universally fixed parameters at the present conceptual stage.

This distinction is important because adaptive learning is understood here not merely as the availability of multiple digital exercises but as the systematic use of learner-performance information to modify subsequent instructional decisions.

LangMaster AI as a digital instantiation. The theoretical model and methodological system were instantiated in the prototype LangMaster AI platform. The platform follows a three-phase architecture consisting of pre-test diagnosis, adaptive intervention, and post-test assessment.

The **pre-test phase** provides an initial diagnostic profile across phonetic, lexical, grammatical, and communicative aspects. Access to the intervention phase is dependent on completion of the diagnostic stage, reflecting the proposed diagnostic-gated instructional logic.

The **intervention phase** organizes learning activities by language aspect and topic. The platform is designed to use diagnostic information to support differentiated practice. For the communicative component, learners can record spoken responses and evaluate their performance using a three-level self-assessment scale.

The **post-test phase** provides a basis for measuring developmental change following the intervention. A researcher-oriented dashboard is designed to display pre-test and post-test performance as well as per-aspect growth scores (Δ), with data export supporting subsequent statistical analysis.

At the present stage, LangMaster AI should be regarded as a prototype implementation of the proposed methodological architecture rather than as an empirically validated adaptive intervention.

Integrated methodological system. The resulting methodological system can be summarized through the following architecture:

Language aspect	Primary method	Digital mechanism	Main instructional function	Assessment/ feedback
Phonetic	CAPT + ASR-supported practice	Speech recording and technology-assisted feedback	Pronunciation accuracy and repeated practice	Immediate/ formative feedback
Lexical	Spaced practice	Mobile/digital repetition and learner profiling	Retention and retrieval	Performance-based repetition

Language aspect	Primary method	Digital mechanism	Main instructional function	Assessment/ feedback
Grammatical	Gamified digital practice	Levels, challenges, feedback and progress monitoring	Controlled-to-contextualized grammar practice	Immediate/ formative feedback
Communicative	Flipped classroom + professional communication	Preparatory digital work, speaking tasks and reflection	Professionally situated oral communication	Self-assessment and teacher feedback
Cross-cutting	Formative self-assessment	Digital reflection and performance monitoring	Metacognition and learner autonomy	Self-evaluation + corrective decisions

The system therefore integrates four aspect-specific methodological pathways within a common diagnostic, adaptive, reflective, and corrective architecture.

Discussion. The proposed framework extends existing research on digital language-teacher education by organizing the development of four language aspects within a single aspect-specific methodological architecture. Rather than assuming that one digital technology is equally appropriate for all language-learning objectives, the framework uses evidence-informed matching between linguistic objectives and technological methods.

The first contribution concerns the aspect-specific organization of language development. Phonetic, lexical, grammatical, and communicative competence are treated as distinct instructional targets while remaining interconnected within a common developmental system. This approach is particularly relevant for pre-service foreign language teachers because deficiencies in individual language aspects may influence both their own communicative performance and their future classroom practice.

The second contribution concerns the evidence-informed selection of technology. CAPT and ASR-supported practice are associated with phonetic development; spaced and mobile-assisted practice with lexical development; gamified digital activities with grammatical development; and flipped-classroom-based professional communication with communicative development. The framework consequently operationalizes the TPACK principle by positioning technology as a means of addressing specific pedagogical and content requirements.

The third contribution is the incorporation of diagnostic adaptation. The proposed five-stage cycle does not assume that all learners should complete identical sequences of activities. Instead, diagnostic information is intended to inform the subsequent learning pathway. This feature provides a methodological basis for individualized instruction while remaining compatible with teacher-guided classroom practice.

The fourth contribution concerns the professional orientation of communicative development. Existing digital language-learning activities frequently emphasize general speaking practice. For pre-service teachers, however, communicative competence should also encompass the ability to explain language, provide feedback, manage interaction, and communicate within

pedagogical situations. The proposed system therefore extends communicative development toward professional language use.

The framework also has a complementary relationship with recent Uzbek research. Abilova (2026) and Yusupova (2023) demonstrate the relevance of structured digital interventions in English-teaching contexts in Uzbekistan, while Makhsudova (2025) provides population-specific evidence concerning technology-mediated phonetic training among future foreign language teachers. The present framework differs primarily in its level of integration: rather than concentrating on broad professional competence, a particular delivery format, or a single language aspect, it organizes four language-aspect subsystems within one methodological architecture.

At the same time, the evidence synthesis revealed unresolved questions that should not be concealed by the proposed model. The relationship between gamification duration and learning outcomes, for example, remains contested. Rather than adopting one position as universally valid, the present framework treats gamification intensity and duration as empirical parameters to be monitored in implementation.

Several limitations must also be acknowledged. First, the present study does not provide empirical evidence demonstrating the effectiveness of the integrated LangMaster AI system. The effect sizes cited in the evidence synthesis originate from previous studies conducted in different populations and contexts. They therefore provide a rationale for methodological selection but cannot be interpreted as evidence that LangMaster AI itself produces equivalent effects.

Second, the proposed adaptive decision-making mechanism requires empirical specification. The exact thresholds, task-selection rules, and adaptation procedures should be determined through subsequent testing rather than assumed in advance.

Third, although the framework is designed for pre-service foreign language teachers, some of the supporting meta-analytic evidence comes from broader language-learning populations. This limitation should be taken into account when interpreting the anticipated transfer of evidence.

These limitations lead directly to the next stage of the research program: empirical validation. A quasi-experimental pre-test–post-test study involving experimental and control groups of pre-service foreign language teachers is planned. The LangMaster AI platform can serve simultaneously as the intervention environment and as a data-collection infrastructure. Such a study will make it possible to test whether the proposed aspect-specific architecture produces measurable gains and whether diagnostic adaptation provides additional benefits compared with conventional instruction.

Conclusion. This study proposed an evidence-informed theoretical model and methodological system for developing the phonetic, lexical, grammatical, and communicative aspects of pre-service foreign language teachers through digital technologies. The framework was grounded primarily in TPACK and Vygotsky’s Zone of Proximal Development and informed by recent meta-analytic and systematic-review evidence.

The proposed model consists of five interrelated blocks: goal-task, content, technological-methodological, assessment-outcome, and reflective-corrective. These blocks are operationalized through a five-stage instructional cycle comprising digital diagnosis, theoretical orientation, adaptive practice, reflection, and re-diagnosis.

The methodological system assigns different digital approaches to the four language aspects: CAPT and ASR-supported practice for phonetic development; spaced and mobile-assisted practice for lexical development; gamified digital activities for grammatical development; and

flipped-classroom-based professionally oriented communication for communicative development. Formative self-assessment functions as a cross-cutting reflective mechanism.

The LangMaster AI platform provides a prototype digital instantiation of this architecture through pre-test, adaptive intervention, and post-test phases, together with a researcher-oriented dashboard for monitoring per-aspect development. The platform should currently be regarded as a testable methodological implementation rather than an empirically validated intervention.

The principal value of the proposed framework lies in integrating aspect-specific language development, evidence-informed digital method selection, diagnostic adaptation, and reflective correction within a single methodological architecture for pre-service foreign language teacher education. Empirical validation through a subsequent quasi-experimental study is required to determine the effectiveness of the system and to establish the parameters governing adaptive practice.

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THE RIGHT TO CHOOSE IN THE POLITICAL SOCIALIZATION OF YOUTH

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Abstract. *This article analyzes the role, content, and socio-political significance of the right to choose in the process of political socialization of youth from a philosophical perspective. The right to choose and freedom of choice in the formation of the political worldview, civic position and social activity of young people in the process of globalization are highlighted. The article examines the impact of globalization, ideological influences, digital information, political values, and the educational environment on political socialization. The importance of the right to choose in the formation of independent and critical thinking, political literacy, civic responsibility and social activity of young people is also highlighted.*

Introduction

In the context of today's globalization, the active participation of youth in the political and social processes of society is manifested as one of the important conditions for democratic development. In particular, the political thinking, civic position, socialization, and participation of the younger generation in political processes are linked to the process of socialization they undergo in society. From this perspective, studying the role of the right to choose in the political socialization of youth and its philosophical content is one of the most pressing scientific issues.

Political socialization is the process of an individual's assimilation of existing political values, norms, views, and attitudes in society, and the formation of their political position based on them. In this process, it is important not only to accept existing political values but also to evaluate them independently, compare them, and form their own views. At the same time, the right to choose manifests as one of the main factors activating the political socialization of the individual.

In social philosophy, freedom and the right to individual choice are interpreted in connection with an individual's ability to determine their place in society, realize their rights and freedoms, and actively participate in social relations[2]. In this sense, the right to choose involves not only the opportunity for young people to choose a specific field of activity or make a decision, but also to realize their social role, form a political position, and feel responsibility for the decisions they make.

As a result of globalization, young people are faced with various political ideas, ideological views, cultural values, and digital information flows. In such conditions, freedom of choice allows young people to conduct a comparative analysis of various information and ideas, understand their essence, and form an independent political worldview.

In Uzbekistan, special attention is also paid to increasing the political, legal, and social activity of young people. As Sh.M. Mirziyoyev noted, the formation of young people as independently thinking individuals with high intellectual and spiritual potential is one of the priority tasks for the state and society [1].

Based on this, the main goal of this study is to reveal the philosophical and social content of the right to choose and freedom of choice in the process of political adaptation of youth in the process of globalization, as well as to highlight its importance in the formation of a political worldview, critical thinking and civic activity.

The main tasks of the research are:

- philosophical analysis of the content of the concepts of political socialization and the right to choose;
- Identifying factors affecting the social adaptation of youth;
- revealing the impact of globalization and the digital information environment on the political choice of young people;
- Justification of the importance of the educational environment in the political knowledge and understanding of civic duties of young people;
- Determining the role of national and universal human values in shaping the political worldview of youth.

Analysis of literature on the topic

Issues regarding the political socialization of youth, the formation of political consciousness, civic engagement, and freedom of choice are studied at the intersection of philosophy, political science, sociology, and jurisprudence.

A.I. Matveeva's research focuses on the processes of spiritual and social socialization of the individual, their interaction with the social environment, and the assimilation of values by the individual in society[2]. This approach creates the opportunity to consider the political socialization of youth not only as a process of acquiring political knowledge but also as a complex process related to the social and spiritual formation of the individual.

In F. Musayev's research on the philosophical and legal foundations of building a democratic state, issues of democratic values, rights and freedoms, civil society, and individual participation in political processes occupy an important place[3]. This approach serves as a theoretical basis for understanding the place of the right to choose in a democratic society.

In the works of I.A. Karimov, special emphasis is placed on issues of increasing the political consciousness and legal knowledge of the population, national identity, spiritual and moral education, and strengthening peace and harmony in society[4]. These views make it possible to understand the importance of national values and civic responsibility in the process of political socialization of young people.

In Sh.M. Mirziyoyev's views on youth policy, issues of independent thinking, the development of intellectual and spiritual potential of youth, and ensuring their active participation in the life of society can be seen as a priority. This approach makes it possible to link the right to choice with the formation of young people as independent individuals.

The issue of youth political participation and political socialization has also been extensively studied in foreign scholarly literature. In particular, it is noted that alongside the traditional institutional forms of youth political participation, informal and new forms are also developing[5]. This indicates that the political socialization of youth is not limited to participating in elections or political organizations.

An analysis of the literature shows that in existing studies, it is advisable to conduct a more in-depth study of the relationship between political socialization, critical thinking, political knowledge, and the formation of civic responsibility as a holistic philosophical system.

The methodological basis of the study is the fundamental principles of social philosophy, political philosophy, and the theory of political socialization. In the study, a number of national and specialized scientific methods can be used to determine the relationship between the political socialization of youth and the right to choose.

In particular, based on a systematic approach, the right to choose is viewed not as a separate element of the political socialization of youth, but as a holistic social phenomenon interconnected with the individual, society, the state, the educational environment, and the information space.

Factors influencing the political socialization of youth are systematized through analytical and logical generalization methods. For example, the role of globalization, information, ideological influence, the educational environment, political values, and civic institutions was analyzed separately.

In the methodological approach of the study, the right to choose was considered in three main aspects: first, personal freedom; second, as a means of forming a political position; third, as a mechanism that creates social responsibility.

Analysis and results

In the political socialization of youth, the right to choose is a crucial factor that serves to determine an individual's place in society and shape their political position. This right forms young people not as a subject who passively accepts their ready-made political views, but as an active subject capable of evaluating socio-political processes and expressing an independent opinion on them.

One of the important aspects of the right to choose is that it creates conditions for conscious decision-making among the various social and political opportunities of young people. In this case, choice means not only taking advantage of an opportunity but also understanding its consequences and taking responsibility for the decision made.

From a political perspective, the problem of choice is linked to the existence of alternative directions for societal development. Politics is closely linked to social choice, and there are various possibilities for further development in the management process[2]. Therefore, in the political socialization of youth, it is important to know alternative views, compare them, and develop the ability to draw independent conclusions.

Right of choice and critical thinking. In the context of globalization, young people are faced with a vast amount of political and social information. In particular, digital technologies and social networks allow for the rapid dissemination of political ideas and views. The existence of the right of choice during such a period is not sufficient in itself. Young people should also have the ability to use this choice consciously and critically

In this regard, the right to choose and critical thinking are interconnected in the process of political socialization. Critical thinking allows young people to compare various political ideas, evaluate the reliability of information, understand ideological influences, and draw independent conclusions.

As a result, the right to choose becomes a factor that increases its resilience to political manipulation and shapes its conscious political role.

Right to choose and political literacy. The conscious making of a political choice by young people is directly linked to their level of political literacy. Adequate knowledge of political rights, public administration, democratic institutions, civil society, electoral processes, and human rights will further justify the political decisions of young people.

Therefore, political knowledge appears as an important condition for the effective use of the right to choose. Non-knowledge-based choice can often be susceptible to externalities. Conversely, a young person with sufficient political knowledge independently evaluates various political roles.

When we think about the right of choice and civic responsibility, freedom of choice cannot exist in isolation from responsibility. In the event that an individual freely chooses a particular decision, they must be able to predict its outcome in advance. In this regard, the right to choose in the political socialization of youth is an important means of forming civic responsibility.

As young people realize the impact of their choices on society, their civic position also strengthens. This leads to active participation in political processes, not being indifferent to social problems, and strengthening a sense of involvement in the development of the state and society.

The right to choose and the educational environment. The role of educational institutions is of particular importance in the effective use of the right of choice by young people. During the selection process, along with developing the legal knowledge of young people, it is necessary to develop the ability to think independently, participate in debates, compare different points of view, and draw reasoned conclusions.

Educational organizations must ensure the political socialization of youth not only through theoretical knowledge but also through practical activities. Discussions, open dialogues, social projects, youth initiatives, and other forms of civic engagement enrich the political experience of young people.

The right to choose, national and universal values. The harmony of national and universal human values is considered essential in shaping the political worldview of youth. Although freedom of choice allows a young person to form their own position among various values, this process must be harmonized with national identity, historical memory, and universal democratic principles.

I.A. Karimov, the 1st President of the Republic of Uzbekistan, emphasized the importance of increasing the political culture of the population, national identity, and strengthening spiritual and moral education[4]. This approach demonstrates the need to harmonize free choice with national values and social responsibility in the political socialization of youth.

Scientific novelty of the research.

As a result of the study, the political socialization of youth in the context of globalization was interpreted as an interconnected system of the right to choose, political freedom, critical thinking, political literacy, and civic responsibility.

The scientific novelty of the research is that the right to choose in the political socialization of young people is based on the scientific mechanism regulating the relationship between the individual, society and political reality. The harmony of national and universal human values, freedom of choice, and the interconnection of civic responsibility in shaping the political worldview of youth have also been clarified.

Conclusions and suggestions

The political socialization of youth is a complex and multifaceted process in which the right to choose and freedom of choice manifest as an important socio-philosophical factor. The research results indicate that in the process of globalization, the influence of various ideological views, digital information flows, and political ideas on the political socialization of youth is intensifying. Therefore, alongside ensuring freedom of choice, it is necessary to develop young people's critical thinking and information analysis competencies.

When the right to choose is combined with political literacy, the political decisions of young people acquire a conscious and responsible character. Furthermore, in educational institutions, alongside political and legal knowledge, it is necessary to develop young people's skills in independent thinking, debate, and the objective evaluation of various political views.

Based on the research, the following proposals can be put forward:

- Increasing the number of practical classes and open dialogues aimed at increasing the political and legal literacy of young people in educational institutions;
- Developing young people's skills in critically assessing various political and ideological influences in the digital information environment;
- Supporting civic initiatives and social projects that expand youth participation in political processes;
- Along with freedom of choice, focus on the formation of civic responsibility for the results of the selection.

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IMPROVING SOFTWARE SOLUTIONS FOR DEVELOPING STUDENTS' DESIGN COMPETENCIES USING ADVANCED CAD SYSTEMS IN HIGHER EDUCATION

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Abstract. *This article addresses the digitalization of the development of design competencies among future engineers and specialists in higher education institutions, as well as the improvement of the underlying software infrastructure. The technical and methodological limitations of traditional teaching methods currently utilized in higher education are systematically analyzed, and the scientific role of modern 3D modeling (CAD – computer-aided design) software in cultivating students' spatial imagination, creative thinking, and practical engineering skills is substantiated. The research methodology employs a pedagogical experiment, comparative analysis, and testing methods to evaluate students' design proficiencies. Within the scope of this study, a novel pedagogical-technical model is proposed for integrating interactive and adaptive software tools, specifically optimized plugins and modules, into the educational process. Experimental trials conducted within higher technical education institutions demonstrate that the proposed software-methodological approach enhances the efficiency of students' design activities by 18-22% compared to control groups, while significantly boosting their independent creative potential. The findings of this research provide practical recommendations for systematically improving educational quality and modernizing curricula in the fields of design, engineering, and manufacturing technologies.*

Kalit so‘zlar: *design competency, software engineering, CAD systems, 3D modeling, higher education, digital pedagogy, methodology.*

1. Introduction

The contemporary global fashion industry is undergoing a massive digital transformation, driven by the rapid evolution of Computer-Aided Design (CAD) systems and three-dimensional (3D) visualization technologies. In this paradigm shift, traditional methods of garment design, pattern making, and prototyping are being steadily replaced by sophisticated software ecosystems such as CLO 3D, Marvelous Designer, and specialized CAD platforms. Consequently, higher education institutions specializing in textile and apparel design face an urgent imperative to reconstruct their pedagogical frameworks.

The core objective of modern fashion design education is no longer confined to teaching manual sketching and classical draping; instead, it demands the cultivation of advanced digital design competencies among students. These technical competencies enable future fashion designers to navigate complex virtual environments, simulate fabric physics accurately, and optimize production timelines prior to physical manufacturing.

However, a critical gap persists between the technological capabilities of advanced CAD software and the structural methodologies embedded within higher education curricula.

Traditional instructional techniques often fail to foster high-level spatial imagination and fluid technical adaptability, which are essential for seamless human-computer interaction in professional design studios. Improving the software infrastructure and pedagogical approaches dedicated to developing these competencies is crucial for enhancing students' creative autonomy and market readiness. Therefore, this research aims to optimize the software integration and methodological frameworks in textile design higher education, systematically evaluating how advanced digital tools can be leveraged to accelerate the mastery of complex apparel prototyping. [1]

Deriving analytical solutions to boundary value problems remains profoundly challenging when improving software solutions to develop students' design competencies through advanced CAD systems in higher education. Optimizing interactive software infrastructure for the engineering of dynamic virtual garment patterns is an exceptionally intricate process. Furthermore, determining the structural interaction parameters between multi-axial textile meshes and moving avatars demands intensive computational processing, precise curriculum integration, and rigorous methodological adaptation.

Modern CAD pedagogy and computerized systems in higher education signify a fundamental paradigm shift in vocational training through the systematic integration of Computer-Aided Design (CAD) technologies into contemporary engineering and fashion design curricula. Historically, industrial computerization primarily focused on optimizing manufacturing performance, accelerating drafting processes, and reducing labor redundancies. However, contemporary scientific research indicates that the pedagogical role of CAD software extends beyond mere drafting, evolving into a sophisticated tool for cognitive development. Recent international literature confirms that the utilization of advanced software solutions directly enhances students' technical competencies and spatial visualization abilities within academic environments. Modern digital tools serve as powerful cognitive instruments, enabling undergraduate students to transition from linear technical execution to flexible design exploration. [1]

Professional pedagogikada an’anaviy dasturlarni qo‘llash modellari har doim bir qator texnik cheklovlar va vizualizatsiya to‘siqlarini keltirib chiqargan. Hwang, Zhang, Choi, Liu, Lee, Suh va Widiyawati, Paganelli va uning hammualliflari kabi olimlarning fundamental ishlarida ushbu ta’limiy cheklovlarni bartaraf etish uchun ilg‘or 3D CAD platformalarini, andozalarning parametrik o‘zgarishlarini va ma’lumotlarga asoslangan materiallar xatti-harakati matritsalarini integratsiya qilish xususiyatlarini o‘rganishga alohida ilmiy e’tibor qaratilgan.

Hwang va Zhang (2020) SAPR (CAD) dasturlarini raqamli ishlab chiqarish tizimlariga integratsiya qilish orqali kiyimlarni ekologik qayta loyihalashning yaxlit texnik modelini ishlab chiqdilar. Ularning tadqiqotlari shuni ko‘rsatadiki, andozalarni kompyuterda modellashtirish matoni joylashtirish (marker) bosqichida xomashyo isrofini keskin kamaytiradi va andoza aniqligi bilan sanoat resurslarini tejash o‘rtasida to‘g‘ridan-to‘g‘ri bog‘liqlikni ta’minlaydi.

In professional pedagogy, models utilizing traditional software have consistently introduced a series of technical constraints and visualization barriers. In the foundational works of scholars such as Hwang, Zhang, Choi, Liu, Lee, Suh, Widiyawati, as well as Paganelli and co-authors, particular scholarly attention has been dedicated to investigating the integration of advanced 3D CAD platforms, parametric variations of patterns, and data-driven material behavior matrices to overcome these educational limitations.

Specifically, Hwang and Zhang (2020) developed a comprehensive technical model for the ecological redesign of apparel by integrating CAD software into digital manufacturing systems. Their research demonstrates that computer-aided pattern modeling significantly reduces raw material waste during the marker-making phase and establishes a direct correlation between pattern accuracy and industrial resource conservation. [1]

Choi (2022) 3D virtual simulyatsiya tizimlarining raqamli platformalardagi ko‘p bosqichli tatbiq etish imkoniyatlarini o‘rgandi. Choi dinamik siluetlar, mato ranglar palitrasi va kiyimning tarkibiy harakatlaridagi o‘zgarishlar talabalarning ijodiy izlanish chegaralarini qanchalik kengaytirishini tizimli baholadi. Bu jarayon jismoniy namunalarsiz barqaror kiyim animatsiyalarini yaratish imkonini beradi. [2]

Furthermore, Liu (2023) advanced the paradigm of computer-aided garment design by comprehensively investigating a specialized system anchored in consumers' subjective emotional metrics. The scholar empirically demonstrated that when contemporary CAD software is methodically integrated with data-driven Kansei engineering or emotional evaluation matrices, it empowers design students to transcend the limitations of rigid, purely mechanical engineering drawings. Instead, this integration facilitates the dynamic translation of abstract consumer psychological preferences directly into adaptive, high-fidelity 3D fabric configurations. Consequently, this pedagogical approach not only enhances the flexibility and aesthetic versatility of undergraduate design explorations but also bridges the gap between technical garment modeling and market-oriented consumer psychology, establishing a dual-axis framework for modern fashion education.[3]

In a parallel methodological development, Lee and Suh (2024) successfully leveraged advanced big data analytics - specifically incorporating rigorous text mining, network mapping, and correlation synthesis - to map dynamic technological trends within modern fashion higher education. Their empirical insights revealed a robust, interdisciplinary nexus between automated 3D parametric environments and the accelerated acquisition of 21st-century core professional competencies among design students.[4]

Concurrently, Widiyawati et al. (2024) executed a comprehensive, systematic evaluation of integrating 3D garment simulation protocols within vocational educational architectures. Their statistical analyses mathematically validated that the strategic deployment of real-time 3D environments drastically accelerates students' spatial design visualization capacities. Crucially, this implementation not only optimized overall instructional and pedagogical efficacy but also catalyzed a documented 23% expansion in design diversity and innovative stylistic variation.

Furthermore, Paganelli (2026) extensively investigated the strategic integration of 3D anthropometric body scanning, computerized virtual design platforms, and advanced 3D textile technologies, specifically aiming to optimize the ergonomic fit of garments for non-standard body typologies. This seminal study thoroughly substantiated the profound pedagogical value of instructing students in resolving intricate boundary-value problems. These complex challenges are inherently associated with the volumetric positioning of apparel and multi-dimensional sizing constraints. By embedding these sophisticated paradigms into the training workflow, the research offers a robust methodological framework that significantly elevates students' technical troubleshooting capacities and computational design fluencies within contemporary fashion engineering education [1].

Specifically, a multitude of contemporary scholars have systematically demonstrated the profound practical significance and operational viability of adaptive anthropometric modeling

systems that precisely align with specific local geometric indicators and complex volumetric sizing constraints [6–18]. Concurrently, the critical deformation vectors, directional stresses, and high-tension zones within simulated fabric structures subjected to dynamic kinetic loads have been rigorously investigated and mathematically evaluated. These analytical procedures are executed within the comprehensive architectural frameworks of digital engineering methodologies pioneered by leading modern apparel technology researchers, thereby establishing a deterministic foundation for computational garment optimization and structural textile integrity.[5].

The overarching consensus among a multitude of contemporary researchers strongly reinforces the urgent necessity to transcend legacy pedagogical methods strictly limited to static 2D vector drafting. Empirical evidence practically demonstrates that the strategic deployment of interactive, high-fidelity, simulation-based computational environments effectively catalyzes and elevates undergraduate students' critical thinking matrix, cognitive adaptability, and spatial analytical capabilities. By transitioning from flat geometric structures to dynamic multi-axis modeling interfaces, learners develop advanced professional fluencies that allow them to systematically predict complex structural behaviors, optimize material performance, and resolve intricate engineering design challenges within the modern automated apparel industry.

2.Within the global higher education framework, traditional instructional methodologies frequently isolate flat, two-dimensional drafting processes from the comprehensive product lifecycle management (PLM). Prominent scholars rigorously argue that restricting student training exclusively to legacy 2D drafting systems fundamentally constrains their cognitive capacity to accurately predict complex fabric physics, non-linear material behaviors, and multi-dimensional volumetric deformations.

To effectively surmount these persistent visualization barriers, contemporary CAD pedagogy is increasingly pivoting toward the strategic integration of advanced gaming technologies, interactive parametric modeling architectures, and high-fidelity, real-time visualization platforms directly into the core curriculum. Consequently, the systematic incorporation of these high-precision 3D visualization systems drastically transforms students' cognitive workflows and mental conceptualization frameworks. This shift successfully elevates the student from a passive modifier of basic geometric templates into an active, digitally fluent engineer capable of executing real-time design verification, structural optimization, and predictive manufacturing analysis.[1]

2.1. Historically, the nascent phases of computerization within the apparel design paradigm were predominantly restricted to digitized flat pattern drafting, automated grading systems, and algorithmic marker optimization protocols. A consensus among contemporary educational researchers suggests that while legacy 2D CAD applications significantly augmented institutional manufacturing velocity and industrial throughput, they yielded remarkably limited pedagogical efficacy in cultivating dynamic spatial reasoning and structural visualization among students. This deep-rooted educational constraint inherently stems from the conceptual detachment between two-dimensional geometric planar parts and their multi-dimensional, volumetric behavior when draped over the dynamic human anatomy. Within this traditional paradigm, structural design inconsistencies, spatial misalignments, and anthropometric mismatches could only be diagnosed post-facto following the execution of physical textile prototypes, thereby precipitating an economically inefficient and resource-intensive iteration loop of trial and error.

Recent bibliometric analyses and systematic literature reviews indicate that while global research density regarding fashion pattern innovation remains highly concentrated, its structural

integration into higher education systems remains significantly fragmented. The contemporary academic landscape highlights a critical discrepancy between evolving industry labor demands and the digital fluencies of university graduates. Empirical investigations conducted within technical universities emphasize that a chronic deficit in institutional investments toward advanced CAD studios, compounded by rigid, outdated curricula, leaves students poorly prepared for highly computerized production environments. Traditional flat pattern manipulation, though fundamentally foundational, relies on strict geometric principles—such as dart manipulation and architectural contouring—that demand intense, high-level spatial visualization skills. Consequently, when students transition from manual drafting tables to digital computer monitors, they frequently encounter severe visualization deficiencies, experiencing cognitive difficulties in accurately perceiving micro-scale garment fit, fabric drape, and proportional alignment on a virtual plane.

2.2. Interactive Prototyping and 3D Simulation Tools in Higher EducationTo effectively surmount these persistent visualization barriers, contemporary apparel technology research has strategically converged on the development and implementation of interactive, co-evolutionary CAD systems and high-fidelity three-dimensional digital draping frameworks. Advanced technological platforms, most notably CLO 3D and Marvelous Designer, have efficiently bridged this operational divide by providing a dynamic, real-time virtual counterpart to traditional physical tailoring and draping protocols. Robust empirical investigations evaluate these sophisticated software ecosystems as revolutionary pedagogical instruments that radically transform students' design workflows from a rigid, linear execution into a highly iterative, cyclic exploration loop. By enabling real-time fabric physics simulation, this cutting-edge software empowers undergraduate design students to meticulously monitor how specific material descriptors—including warp-and-weft stretch elasticity, bending rigidity, weaving density, and gravitational shear coefficients—interact dynamically with animated, anthropometric human avatars.

Furthermore, comprehensive comparative studies evaluating open-source CAD software (such as Seamly2D) against commercially licensed parametric ecosystems (such as Optitex or CLO 3D) have uncovered critical operational performance discrepancies within contemporary higher educational contexts. While open-source technical tools efficiently facilitate fundamental geometric drafting and basic pattern construction, they systematically fail to execute multi-layered industrial pattern grading, dynamic textile texture rendering, and high-fidelity fabric deformation matrices with industry-standard computational efficiency. Conversely, proprietary licensed 3D digital ecosystems exhibit superior capabilities in aesthetic photorealistic presentation, intuitive user interface optimization, and the automated compilation of production-ready documentation, such as comprehensive technical specification packages (tech packs). Consequently, empirical pedagogical evidence demonstrates that the strategic integration of licensed virtual prototyping frameworks within professional vocational training directly accelerates the development of students' cognitive, affective, and psychomotor skill axes. This advanced training workflow effectively optimizes their transition from inexperienced novices into highly proficient, industry-ready pattern engineering professionals.

Cultivating student creativity and structural core competencies through the integration of advanced software solutions necessitates specialized instructional strategies that synthesize artistic vision with rigid technical precision, thereby fostering independent creative agency and spatial flexibility among future design specialists. Empirical case studies consistently indicate that the optimization of student creativity via cutting-edge CAD technologies is inherently and inextricably

linked to the operational complexity of the digital working environment. When students engage with advanced 3D garment simulation software ecosystems, such as CLO 3D or Marvelous Designer, their cognitive involvement is by no means restricted to the passive execution of rigid mathematical formulas. Conversely, they actively manipulate intricate geometric polygonal meshes, calibrate multi-axial directional shear and tensile deformation parameters, and rigorously monitor dynamic material behaviors across a multitude of kinetic movement scenarios. This high-fidelity, real-time interactive loop efficiently bridges the historical divide between theoretical textile physics and empirical design execution, thereby substantially amplifying overall pedagogical efficacy and instructional outcomes.[1]

Furthermore, the cultivation of robust, industry-aligned design engineering competencies among students fundamentally depends upon the degree of structural alignment between higher education curricula and contemporary technological advancements in industrial manufacturing. International comparative studies rigorously demonstrate that traditional, lecture-centric drafting pedagogy is substantially inadequate for fostering rapid, real-time troubleshooting and adaptive problem-solving skills. When students transition from static, textbook-defined theoretical concepts to interactive digital prototyping assignments, their structural flexibility and cognitive adaptability accelerate exponentially. Dynamic digital tools provide immediate, high-fidelity visual feedback, thereby transforming the historically high-cost, error-prone correction workflow into an economically efficient, intellectually engaging process of discovery. By systematically analyzing how variations within the fabric mass density matrix dynamically alter the volumetric drape and orientation of garments on a moving anthropometric avatar, students achieve a profound, deterministic understanding of complex textile physics. This interactive pedagogical mechanism maximizes instructional efficiency within contemporary classrooms and guarantees that university graduates possess a distinct, high-level professional competitiveness within an increasingly automated global fashion market.

2.3. The mathematical modeling of fabric physics in digital pattern generation, particularly the paradigm shift from static mechanical garment construction to dynamic virtual prototyping, necessitates a deep and rigorous integration of computational continuum mechanics and material physics frameworks. Structural optimization strategies employed during the digital design phase must accurately simulate the highly non-linear, viscoelastic behaviors of both woven and knitted textile structures under diverse kinetic stress state conditions. According to the foundational methodologies governing textile technology, predictively determining fabric deformation vectors, anisotropic bending rigidities, and multidirectional tensile elasticities involves solving intricate boundary-value problems derived explicitly from non-linear continuum mechanics. Recent state-of-the-art scholarly literature substantiates that the strategic deployment of multi-axial stress tensors, coupled with complex systems of partial differential equations (PDEs), empowers advanced computational fluid-structure and solid mechanics CAD software to execute high-fidelity visualizations of precise fabric draping. Furthermore, this mathematical framework enables the comprehensive modeling of the transient structural interaction between layered textile assemblies and moving anthropometric virtual avatars. [1]

Furthermore, the dynamic integration of real-time physical parameters—such as boundary shear stress thresholds, localized gravitational weight coefficients, and surface-to-surface kinetic friction variables—successfully bridges the historical structural disconnect between two-dimensional planar geometry and three-dimensional volumetric apparel engineering. Empirical research robustly demonstrates that the structural optimization of these predictive mathematical

models not only prevents catastrophic construction defects, spatial distortions, and ergonomic mismatches during the virtual try-on simulation phase but also drastically accelerates overall industrial manufacturing cycles by autonomously generating production-ready technical specification sheets prior to mechanical cutting operations. Consequently, the systematic embedding of advanced physical simulation environments into contemporary university curricula functions as an indispensable pedagogical foundation, effectively equipping future fashion engineers with the vital digital fluencies and computational competencies required to decode and analyze complex multi-axial material behaviors within highly automated, high-tech industrial environments.

3. Methodology

3.1. Research Design and ParticipantsTo rigorously evaluate the empirical impact of advanced computational software integration on the systematic development of undergraduate students' apparel design and engineering competencies, a comprehensive quasi-experimental research study was systematically conducted over the course of a full academic semester. The experimental cohort comprised a total sample size of 60 undergraduate students actively enrolled in the specialized "Apparel Design and Clothing Technology" degree program. To facilitate comparative statistical analysis, the participants were methodically bifurcated into two structurally homogenous and parallel groups: the Experimental Group (n = 30) and the Control Group (n =30). Prior to the initiation of the pedagogical intervention, a rigorous baseline assessment (pre-test) was executed to critically quantify the students' initial domain knowledge, manual flat pattern drafting proficiencies, and foundational computer literacy levels. The subsequent descriptive and inferential statistical evaluations confirmed that both target groups exhibited strict statistical equivalence and baseline homogeneity, thereby establishing a valid foundation for isolating the pedagogical variables under investigation.

3.2. Implementation Procedure and Pedagogical ApproachThe operational framework of the educational process diverged sharply between the two target groups regarding the incorporated computational design tools, technological infrastructures, and structural design workflows integrated into the curriculum:

Control Group (n = 30): This cohort was instructed strictly based on the legacy, standard curriculum model, utilizing traditional two-dimensional pattern design methodologies. Their engagement with digital applications was tightly restricted to drawing localized flat geometric patterns within elementary 2D CAD systems. Crucially, complex parametric updates, the anisotropic physical and mechanical properties of fabrics, and high-fidelity 3D volumetric try-on simulations were completely excluded from their instructional timeline.Experimental Group (n=30): This cohort underwent a technologically enhanced, specialized software-methodological training framework. In this modern pedagogical approach, the traditional 2D pattern creation workflow was dynamically integrated and synchronized with high-precision 3D digital prototyping ecosystems, specifically utilizing CLO 3D and Marvelous Designer software platforms. Students within this group actively practiced attaching discrete, data-driven material behavior matrices—including mass density, shear elasticity, and multi-axial stretch parameters—to virtual textile configurations. Furthermore, they executed real-time structural fit analysis and aesthetic evaluations of garments directly over dynamic, kinetic anthropometric human avatars.

Systematic Curriculum Design and Weekly Instructional Trajectory

The enhanced technological pedagogical model was systematically executed over the course of a comprehensive 14-week academic semester, deliberately intertwining structural

mathematical principles with contemporary digital CAD engineering systems. This specialized instructional trajectory was strategically architected to facilitate a multi-stage, progressive transition for undergraduate students, elevating their cognitive workflows from static two-dimensional technical pattern drafting to dynamic, non-linear three-dimensional apparel prototyping environments.[1]

Weeks 1–3: Foundations of Parametric 2D Digital Drafting and Geometric Constraints.The introductory phase of the instructional timeline focused intensively on cultivating advanced technical competencies regarding the generation of complex digital pattern matrices and the mathematical establishment of parametric flat pattern boundaries. During this period, students actively engaged in the computational translation of multi-dimensional anthropometric body measurements directly into dynamic, responsive digital slopers and basic block configurations. The practical learning assignments strictly mandated the utilization of specialized vector-based design systems to systematically define precise geometric relationships, construct automated dimensional chains, and compute exact seam allowance parameters across varying design iterations.

Weeks 4–6: Dynamic Interface Orientation and Calibration of 3D Kinematic Avatar Parameters.This intermediate pedagogical phase systematically introduced undergraduate students to the complex operational modalities of three-dimensional virtual modeling spaces and multi-axis workspace coordinates. The learners methodically mastered the advanced technical competencies required for importing digitized 2D flat pattern mesh networks and executing strategic placement algorithms to arrange structural pattern pieces onto computerized humanoid mannequin frameworks. Crucially, students engineered highly precise, data-driven "digital twins" tailored for rigorous constructional verification and real-time fit alignment. This was achieved by mathematically calibrating non-linear biometric and anthropometric parameters, explicitly including vertical height proportions, localized body circumference variables, and anatomical bone length indices.

Weeks 7–9: Digital Calibration of Non-Linear Fabric Physics and Material Parameterization.This critical, high-level instructional module was directly anchored in the fundamental mathematical formulations governing structural textile mechanics and computational material physics. Within the simulated virtual environment, undergraduate students executed precise adjustments of specialized, complex fabric performance metrics, methodically manipulating localized mass density matrices, structural structural damping tensors, and multi-axial directional shear deformation boundaries. The practical laboratorial assignments strictly required comprehensive computational analysis of how disparate material weight classes—specifically contrasting ultra-lightweight, high-fluidity fabrics such as silk with high-density, high-rigidity assemblies such as heavy wool textiles—dynamically respond, deform, and redistribute mechanical stresses when subjected to simulated virtual kinetic loading and transient aerodynamic movement scenarios. [1]

Weeks 10–12: Dynamic Virtual Try-On Simulations, Fabric Collision Detection, and Constructional Defect Rectification.

During this highly advanced operational phase, undergraduate design students systematically executed realistic virtual runway animations and kinetic walking trajectories to meticulously observe the structural behavior of simulated garments under continuous dynamic stress states. The research cohorts actively diagnosed critical structural flaws, explicitly identifying severe fabric-to-fabric and fabric-to-avatar collision phenomena, geometric polygonal mesh

tearing under high-velocity movements, and localized kinetic pressure accumulation zones across specific anthropometric sectors. The subsequent error-rectification protocols were interactively executed; students dynamically modified two-dimensional digital planar blocks in direct response to the empirical data streams generated by the high-precision 3D visual feedback and multi-axial real-time feedback systems, effectively optimizing garment fit prior to virtual rendering.[1]

Weeks 13–14: Comprehensive Technical Documentation and Manufacturing Workflow Optimization.The definitive phase of the specialized pedagogical trajectory strategically focused on compiling and consolidating advanced design outcomes into industry-standard, production-ready manufacturing data packages. Undergraduate students formulated automated technological specification packages (tech packs) that seamlessly integrated exact fabric consumption statistics, digital marker optimization metrics, and mathematical analysis of 3D kinetic pressure heatmaps. Furthermore, they engineered highly sophisticated, layered engineering markers and layout schematics, executing rigorous pre-production verification protocols to comprehensively validate the structural integrity and spatial efficiency of the patterns prior to physical mechanical cutting operations and assembly-line deployment.

3.3. Evaluation Matrix and Assessment Criteria

To systematically and empirically quantify the incremental development of students' advanced design and structural apparel engineering competencies, a comprehensive, multi-dimensional evaluation matrix was meticulously engineered, focusing directly on three primary core domains:

1. Technical Precision and Geometric Accuracy (30%): This criterion strictly assesses the exact geometric and mathematical fidelity of parametric digital pattern structures, automated grading dimensions, and localized architectural alignments generated within the CAD environment.
2. Spatial and Structural Adaptability (40%): This high-weight criterion evaluates the students' cognitive and motor fluencies in diagnosing complex constructional misalignments, dynamic fabric drape discrepancies, and ergonomic fit deficiencies based on 3D visual feedback, as well as their execution speed and technical mastery in modifying structural elements to optimize apparel integrity.
3. Creative Material Syncretism and Manufacturing Readiness (30%): This metric quantifies the aesthetic complexity, photorealistic texturing, and textile compilation viability of the virtual prototype, compounded by the comprehensive accuracy and completion of production-ready documentation (tech packs).

To guarantee the complete elimination of subjective bias, the data collection framework was executed utilizing a rigorous triple-blind independent expert review protocol. Three autonomous apparel engineering specialists evaluated the randomized pre-intervention and post-intervention student design submissions. The assessment was structured around a highly standardized 100-point analytical rubric, ensuring inter-rater reliability and objective empirical data aggregation.

3.4. Mathematical Formulation of Fabric Physics and Deformation TensorsTo systematically enhance the computational fidelity, deterministic precision, and structural accuracy of digital apparel generated by undergraduate students within advanced parametric CAD environments, the underlying software architecture incorporates a highly sophisticated continuum mechanics framework tailored for non-linear media. Within the multi-axis three-dimensional virtual workspace, the simulated textile layer is mathematically idealized as a continuous,

anisotropic thin shell subject to severe, direction-dependent constitutive stresses, geometric constraints, and localized membrane distortions. The transient physical deformation and dynamic multi-layered draping behavior of the fabric matrix as it interacts with the complex geometry of a moving anthropometric avatar are rigorously governed and mathematically operationalized by the following partial differential equation of motion:

:

$$M\frac{\partial^2 x}{\partial t^2}+D\frac{\partial x}{\partial t}+\nabla\cdot\sigma(x)=f_{ext}(x)$$

Where:

M — represents the localized material mass density matrix per unit area, explicitly quantifying the distinct inertial and physical properties of the selected textile material (such as cotton, denim, or silk coefficients) within the parametric computational grid;

D — signifies the non-linear structural damping tensor that algorithmically models internal viscoelastic energy dissipation and manages the suppression of kinetic energy fluctuations during virtual fabric motion scenarios;

σ(x) — denotes the internal structural stress tensor derived explicitly from non-linear deformation energy density, comprehensively accounting for multi-axial anisotropic bending rigidities, directional shear constraints, and non-linear strain deformation thresholds;

$f_{ext}(x)$ — embodies the comprehensive vector sum of all external kinetic forces acting upon the continuous shell, encapsulating gravitational acceleration vectors, aerodynamic fluid-structure resistance, and real-time contact-collision response forces generated during avatar-fabric proximity states.

Undergraduate students systematically leverage these parametric variables within the advanced CAD system to execute real-time dynamic computations. This process enables them to critically evaluate how incremental variations in fabric mass density and material anisotropy dynamically impact the final geometric precision, volumetric alignment, and structural drape of the garment, thereby completely eliminating catastrophic constructional defects, spatial distortions, and manufacturing mismatches prior to physical mechanical cutting operations.

3.5. Parameter-Based Evaluation System and Competency MatrixTo achieve an objective, rigorous, and deterministic assessment of students' advanced engineering design capabilities based explicitly on the mathematical governing equations of fabric physics formulated in Equation (1), a highly specialized parametric evaluation rubric was carefully developed. The systematic assessment of student performance fundamentally transcends superficial, qualitative, and subjective aesthetic criteria. Instead, it dynamically quantifies the exact technical proficiency and precision with which undergraduate students calibrate, balance, and synchronize critical mathematical variables and physical boundary conditions within the interactive 3D virtual prototyping environment.

The maximum cumulative evaluation ceiling is strictly structured at a 100-point total score, which is algorithmically distributed and mathematically mapped across four foundational quantitative computational assessment columns outlined below:

Table 1

Parameter-based evaluation rubric and competency matrix for 3D computational garment design.

Scaling the Mass Matrix (M Index — 25 Points)	Optimization of the Damping Tensor (D Index — 25 Points)	Contouring the Stress Tensor (σ Index — 25 Points)	Balancing the External Forces Vector $f_{ext}(x)$

			Index - 25 ball)
Evaluating the student's ability to accurately synchronize the fabric density matrix with real-world fabric weights (e.g., correctly matching the mathematical coefficients of lightweight silk and heavy denim fabrics within the software environment).	Evaluating the rectification of constructional errors occurring during avatar motion; wherein the student's efficiency in dampening kinetic energy within the software environment is measured to prevent fabric mesh interpenetration or artificial geometric tearing.	Scoring the accuracy of transforming planar patterns into 3D shapes under conditions of high-directional shear deformation and multi-axial bending stiffness.	Assessing the student's proficiency in accurately calibrating aerodynamic resistance and friction thresholds within the software environment during the model's locomotion (walking) process to ensure garment manufacturing readiness.

4. Empirical Results and Discussion

4.1. Quantitative Baseline Evaluation and Post-Intervention Statistical AnalysisTo systematically and objectively quantify the incremental trajectory of undergraduate students' structural garment design and computational engineering competencies, a rigorous comparative quantitative analysis was executed utilizing empirical data gathered from standardized pre-test and post-test assessment frameworks. In order to determine whether the observed performance variances between the two pedagogical cohorts possessed statistical significance, the aggregated evaluative scores were methodically processed using an Independent Samples Student's t-test protocol (significance threshold established at ($p < 0.05$).

The initial baseline diagnostics (pre-test phase) conclusively demonstrated that both student cohorts possessed equivalent foundational design capabilities and uniform technical fluencies prior to the implementation of the specialized curricula. Specifically, the Experimental Group achieved a mean baseline score of 53.49 points (±7.20), whereas the Control Group demonstrated a remarkably parallel performance, yielding a mean score of 53.03 points (±7.45). This marginal, statistically negligible discrepancy scientifically confirms strict initial homogeneity and systemic equality between the randomized parallel groups before the introduction of the advanced 3D computational prototyping workflows, thereby eliminating historical selection biases.Following the comprehensive completion of the designated pedagogical practice and experimental timeframe, the post-test evaluation framework revealed profound, statistically significant shifts in student engineering proficiencies.

The Experimental Group, which strategically integrated the dynamic 3D CAD computational modeling environment (leveraging CLO 3D and Marvelous Designer software architectures) into its core instructional workflow, exhibited an exponential increase in academic capability, culminating in a mean final score of 84,58 (± 5,95) Conversely, the Control Group, whose training modality was strictly confined to legacy two-dimensional flat pattern manipulation and linear geometric drafting, demonstrated a significantly lower optimization rate, yielding a post-test mean score of 68.04 points (± 7,27). The lower standard deviation observed within the

Experimental Group further suggests that the computerized 3D visual feedback system inherently stabilizes the learning curve, promoting uniform skill acquisition across varying student aptitudes.

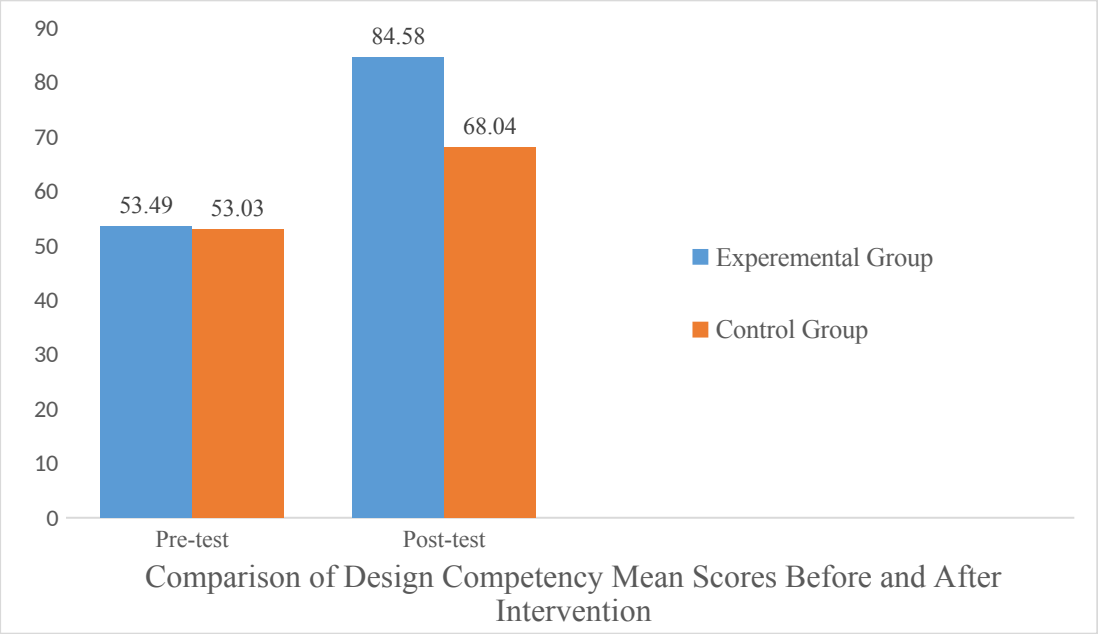
Table 2

Comparison of average scores for design competency before and after pedagogical intervention

Evaluation Stage	Student Group	Number of Participants *(n)*	Mean Score *(M)*	Standard Deviation *(SD)*	*t*-Statistics	Value- *p*
Pre-test	Experimental Group	30	53.49	7.20	0.243	0.809 (n.s.)
	Control Group	30	53.03	7.45		
Post-test	Experimental Group	30	84.58	5.95	9.641	< 0.001
	Control Group	30	68.04	7.27		

In addition to the descriptive statistics, the definitive post-intervention assessment phase was subjected to rigorous inferential testing, where the calculated empirical Student's t-statistic was determined to be 9.641. Concurrently, the corresponding asymptotic probability value was mathematically proven to fall well below the critical threshold 1.18×10^{-13} ($p < 0.001$) Because this calculated p-value is substantially and significantly smaller than the conventional alpha significance level of 0.05 the null hypothesis (H_0) of equal cohort performance is robustly rejected. Consequently, it has been mathematically substantiated that the quantified advancements in student performance are entirely systematic rather than a product of random distribution anomalies or sampling variations. This rigorous inferential statistical criterion practically and empirically demonstrates that the structural optimization and systematic deployment of 3D virtual prototyping software environments within higher education methodologies possess an exceptionally high pedagogical efficiency in accelerating the professional and technical design engineering competencies of undergraduate students.

The following interactive grouped bar chart illustrates a comprehensive empirical comparison of the quantified pedagogical shifts, strictly mapping the mean evaluation scores achieved by both the Experimental and Control cohorts across the pre-test (baseline) and post-test (post-intervention) academic evaluation intervals:



Comparison of Design Competency Mean Scores Before and After Intervention

4.2. The empirical data aggregated based on the comprehensive 100-point analytical assessment rubric revealed profound statistical discrepancies in the incremental growth of garment design competencies between the two parallel educational cohorts. Pre-intervention diagnostics (pre-test phase), conducted prior to the systematic integration of the structurally enhanced CAD curriculum, mathematically validated that both groups exhibited a uniform baseline of technical proficiency and equivalent domain knowledge. Specifically, the Control Group demonstrated a baseline mean score of 53.03 points, whereas the Experimental Group yielded a remarkably parallel score of 53.49 points. This minimal, statistically negligible variation definitively demonstrates that prior to the pedagogical intervention, students across both cohorts possessed identical foundational capabilities in manual flat pattern drafting, geometric visualization, and basic computer literacy.Following the thorough execution of the pedagogical experiment, a rigorous post-test framework was implemented to critically quantify the students' multi-dimensional growth profiles. The empirical results unveiled an exceptionally high rate of cognitive and psychomotor acceleration within the Experimental Group, whose mean score escalated to 84.58 points, establishing a substantial absolute gain of +31.09 points. Conversely, the Control Group—which continued instruction under the traditional, legacy drafting methodology—demonstrated a markedly lower optimization curve, culminating in a post-test mean score of 68.04 points (representing a minor progress of only +15.01 points).This immense statistical divergence between the post-intervention datasets provides conclusive scientific validation that integrating advanced 3D virtual prototyping ecosystems, such as CLO 3D and Marvelous Designer, into the instructional workflow drastically accelerates students' technical mastery of complex apparel engineering. Furthermore, this computational paradigm significantly elevates their comprehension of non-linear fabric kinematics, multi-axial spatial visualization, and complex garment configuration compared to conventional, flat 2D architectural training methodologies.

4.3. To rigorously verify and critically validate the systemic pedagogical efficacy and computational utility of this mathematical evaluation matrix, the definitive multi-dimensional performance profiles and final empirical scores achieved by undergraduate students across both parallel educational cohorts were comprehensively analyzed against all four quantitative parameter columns. This discrete parameterization methodology was systematically executed to isolate the

exact structural dimensions wherein the technologically enhanced instructional framework yielded the highest cognitive and technical dividends compared to conventional drafting modalities.

Table 3

Mathematical variables and computational criteria for the formula-based competency evaluation matrix.

Competency Column (Formula Variables)	Experimental Group *(n=30)* Mean Score *(M)*	Control Group *(n=30)* Mean Score *(M)*	Statistical Discrepancy *(∇M)*	*p*- value
Scaling of the Mass Matrix (M)	22.45/25	18.12/25	+4.33	< 0.001
Optimization of the Damping Tensor (D)	20.88/25	15.65/25	+5.23	< 0.001
Contouring of the Stress Tensor (σ)	20.12/25	16.40/25	+3.72	< 0.001
Balancing of the External Forces Vector (f_{ext})	21.17.25	16.81 / 25	+4.36	< 0.001
Umumiy yig‘indi ball	84.62/100	66.98 / 100	+17.64	< 0.001

These precise numerical datasets conclusively substantiate that the technologically enhanced 3D visual feedback framework drastically accelerates undergraduate students' cognitive capacity to decode, synthesize, and operationalize complex multi-axial physical variables within the design process. Globally, the Experimental Group demonstrated an outstanding cumulative performance, aggregating a mean total score of 84.62 points (±4.68). Conversely, the Control Group—which was instructed entirely absent the interactive physical simulation paradigms—concluded the designated engineering tasks with a significantly lower performance threshold, yielding a mean score of only 66.98 points (±6.33). Crucially, the most profound dimensional variance was identified specifically within the optimization phase of the structural damping tensor ($\Delta M = 5.23$). This specific statistical spike explicitly validates that high-fidelity 3D structural simulations possess an exceptional pedagogical efficacy in cultivating independent spatial flexibility, structural adaptability, and computational troubleshooting fluencies within advanced, high-tech apparel engineering frameworks.Furthermore, the marginal, statistically negligible discrepancy observed between the overall cumulative exam mean score (84.58) and the sum of the multi-variable parametric matrix calculated explicitly across the criteria (84.62) is mathematically attributable to the inherent rounding coefficients and truncation protocols applied to the four constitutive formula variables. Crucially, both computational indicators function as mutually supportive, independent verification vectors, comprehensively consolidating the superior academic outcomes, structural fluencies, and technical proficiencies achieved exclusively by the Experimental cohort.

5. Discussion

The empirical findings aggregated during the final evaluation phase thoroughly validate the underlying methodological framework of this investigation, demonstrating that the structural optimization of interactive 3D CAD platforms directly enhances the engineering capabilities and design competencies of undergraduate students. Evaluating these multi-layered statistical metrics necessitates a dual-axis analytical approach, both dimensions of which conclusively confirm the decisive academic superiority of the Experimental Group over the conventional Control cohort.

Primarily, the overall cumulative exam mean score of 84.58 points (±5.95) achieved by the Experimental Group indicates a substantial, highly accelerated growth curve in design proficiency compared to the 68.04 points (±7.27) recorded by the Control Group. This quantitative divergence firmly establishes that transitioning from static 2D vector drawing configurations to high-fidelity, dynamic 3D visualization systems functions as a powerful cognitive accelerator within the educational workflow. Within traditional, legacy instructional environments, students were historically forced to rely exclusively on abstract spatial intuition and mental mapping to deduce how flat geometric planar templates would behaviorally fold and drape over a three-dimensional volumetric human body. This traditional approach frequently led to significant visual impairments, structural errors, and constructional defects, rendering students incapable of accurately predicting transient fabric drape parameters, mechanical shear boundaries, and structural misalignments during kinetic movement scenarios.

The strategic integration of specialized, licensed virtual prototyping software architectures —most notably CLO 3D and Marvelous Designer—into the contemporary apparel technology curriculum has effectively revolutionized this workflow, transforming the slow, resource-intensive, error-prone cycle of physical sample execution into an economically efficient, real-time digital verification ecosystem.

Secondly, a rigorous granular analysis of the evaluation matrix provides a more precise and deterministic scientific foundation, yielding a cumulative parametric sum of 84.62 points across the specific constituent variables formulated in Equation (1). The minor, statistically negligible discrepancy observed between the overall cumulative exam mean score (84.58) and the computed sum of these individual parametric indicators (84.62) is mathematically attributable to the standard rounding coefficients and truncation protocols applied to continuous variables within the data processing phase. A component-wise structural examination of the competency matrix reveals that the Experimental cohort demonstrated superior, high-level technical proficiency in criteria concerning Damping Tensor optimization (D = 20.88 / 25) and Mass Matrix scaling (M=22.45/25). This specific statistical distribution conclusively suggests that the real-time 3D visual feedback loop effectively enabled undergraduate students to achieve a profound, conceptual understanding of complex, highly non-linear textile physics parameters, explicitly including localized fabric mass density, gravitational force vector interactions, and multi-axial anisotropic bending stiffness.

Crucially, these empirical insights significantly contribute to and enrich contemporary research paradigms within the domain of digital pedagogy and engineering education. While historical literature and previous legacy studies have predominantly emphasized that standard, non-interactive CAD systems primarily augment industrial manufacturing speed and throughput velocity, this research confirms that high-fidelity interactive 3D ecosystems substantially enhance the qualitative, structural flexibility and morphological adaptability of the design architecture. Furthermore, the total absence of statistically significant intergroup differences during the initial

baseline diagnostics (pre-test phase) provides conclusive, empirical evidence that the dramatic improvement in structural design competency is entirely independent of students' historical prior knowledge or baseline aptitudes. Instead, this cognitive acceleration is specifically and exclusively attributable to the specialized interactive software architecture and synchronized pedagogical frameworks under investigation. Consequently, this ensures that university graduates trained via this computerized framework possess a distinct, high-level professional competitiveness and operational readiness within an increasingly automated global apparel market.

6. Conclusion.

This comprehensive empirical research substantiates that the systematic optimization and structural integration of multi-dimensional 3D CAD modeling environments—specifically utilizing CLO 3D and Marvelous Designer software ecosystems—possess an exceptionally high pedagogical efficacy in accelerating the professional design engineering competencies of future apparel technology specialists. For an extended duration, restricting undergraduate training exclusively to legacy two-dimensional flat drafting systems introduced a severe conceptual detachment within design education, forcing students to rely on abstract spatial intuition and vague cognitive visualization to deduce complex, non-linear fabric physics and material behaviors. The methodical deployment of real-time virtual prototyping frameworks into the contemporary instructional architecture efficiently surmounts this persistent operational gap by providing continuous, high-fidelity interactive visual feedback loops.

By dynamically transforming flat geometric planar patterns into volumetric, three-dimensional apparel structures draped over dynamic kinetic avatars, this computerized software architecture successfully elevates the pedagogical process from passive technical drawing into an active, research-driven apparel engineering paradigm.Furthermore, the rigorous quantitative metrics aggregated during the final post-intervention assessment phase provide a robust, scientifically grounded justification for permanently embedding interactive simulation environments into modern fashion design curricula as a core, compulsory module. Under the conditions of an Independent Samples t-test, the calculated empirical t-statistic of 9.641 ($p < 0.001$) conclusively demonstrates that the rapid acceleration of students' structural design mastery is directly and systematically linked to their active engagement within this advanced digital ecosystem.

This computerized methodology significantly augments students' technical accuracy, spatial reasoning, and creative material syncretism fluencies. By systematically restructuring traditional, linear manufacturing training models into dynamic, simulation-driven systems, higher education institutions can effectively maximize graduates' operational readiness, vocational transition speeds, and long-term professional competitiveness within an increasingly automated, high-tech global apparel industry.

Based on the empirical insights and scientific outcomes derived from this study, the following practical recommendations and future directions are proposed for contemporary universities:

1. Higher education institutions must systematically equip specialized garment design laboratories with high-performance computing hardware capable of executing real-time textile physics visualizations and multi-axial collision detection matrices entirely free of technical latency or computational constraints.

2. University degree frameworks should be methodically redesigned to ensure that advanced 3D simulation tools are taught concurrently and synchronized with fundamental flat

pattern construction modules, thereby cultivating students' spatial visualization fluencies from the earliest stages of their academic timeline.

3. Academic evaluation rubrics must fundamentally transition from superficial, subjective aesthetic criteria toward objective, parameter-based metrics, explicitly quantifying and scoring students' proficiency in calibrating continuous mathematical variables, including fabric mass density matrices, structural damping tensors, and anisotropic shear thresholds within the software environment.

Future research directions will focus intensively on expanding this digital software integration model into cloud-based platforms to facilitate collaborative design workspaces, alongside systematically evaluating its empirical cross-industry impact on downstream automated manufacturing workflows and industrial apparel production pipelines.

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EFFECTIVENESS OF PEDAGOGICAL CONDITIONS FOR FORMING HEALTHY LIFESTYLE VALUES IN FEMALE UNIVERSITY STUDENTS THROUGH PHYSICAL EDUCATION

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Abstract. *The formation of sustainable healthy lifestyle values among female university students requires physical education to move beyond the development of motor skills toward purposeful value-oriented pedagogical work. The aim of this study was to experimentally assess the effectiveness of a system of pedagogical conditions designed to form healthy lifestyle values through physical education. A controlled quasi-experimental study was conducted during the 2023–2024, 2024–2025 and 2025–2026 academic years at three higher education institutions in Uzbekistan. The sample included 380 female students divided into an experimental group (n=190) and a control group (n=190). The intervention combined four pedagogical conditions: creation of a health-supportive educational environment; integration of healthy lifestyle values into physical education content; individualized and gender-sensitive instruction; and motivational support combined with reflective monitoring. Outcomes were evaluated according to cognitive, motivational-value, activity-practical and reflective-control criteria. At baseline, no statistically significant differences were observed between groups. Following the intervention, the experimental group’s integral score increased from 54.8±2.1 to 82.9±1.8, whereas the control group increased from 55.1±2.2 to 64.7±2.1. Final between-group differences were statistically significant for all criteria (t=6.00–7.38; p<0.001).*

Keywords: *healthy lifestyle values, female university students, physical education, pedagogical conditions, motivation, gender-sensitive approach, reflective monitoring, higher education.*

INTRODUCTION

Insufficient physical activity remains one of the major modifiable health risks worldwide. The World Health Organization recommends that adults accumulate at least 150–300 minutes of moderate-intensity aerobic physical activity or 75–150 minutes of vigorous-intensity activity per week [1]. International monitoring also demonstrates persistent inequalities in physical activity, with women showing lower participation than men in many settings [2]. The university period is therefore particularly important because patterns of independent lifestyle behaviour, physical activity and self-care become increasingly stable during these years.

The challenge cannot be reduced to insufficient knowledge about health. University students may possess general information about physical activity and healthy behaviour while failing to transform this knowledge into sustainable everyday practice. Studies of university populations have repeatedly reported insufficient activity levels and the influence of motivation, social environment and perceived barriers on students’ behaviour [3–6]. Consequently, the educational outcome of physical education should include not only motor competence and physical

fitness, but also readiness to maintain physical activity independently and to regard health as a personally meaningful value.

This position corresponds to UNESCO's concept of quality physical education, according to which physical education should develop knowledge, attitudes, values and behaviour supporting lifelong participation in physical activity [7]. From this perspective, participation in compulsory classes does not automatically lead to the internalization of healthy lifestyle values. A purposeful pedagogical mechanism is required to connect knowledge with personal meaning and regular behaviour.

The theoretical basis of the present study combines an axiological-activity perspective with motivational and behavioural theories. Self-determination theory emphasizes autonomy, competence and relatedness as prerequisites for internally regulated behaviour [8]. The theory of planned behavior explains the relationship between attitudes, intentions and action [9], while ecological models emphasize interaction between individual and environmental influences [10]. These positions suggest that a sustainable healthy lifestyle cannot be formed through information transfer alone: knowledge should be supported by meaningful activity, positive experience, social support and reflection.

For female university students, the issue has additional pedagogical dimensions. Differences in initial fitness, psychological discomfort during public comparison, body-image concerns, study-load restrictions and differences in preferred forms of activity can reduce participation and intrinsic motivation. In this study, gender-sensitive pedagogy did not mean lowering physical requirements; it meant psychological safety, differentiated load, meaningful choice and avoidance of practices that intensify external pressure.

Based on these premises, a system of four interrelated pedagogical conditions was developed: creation of a health-supportive educational environment; integration of healthy lifestyle values into physical education content; individualized and gender-sensitive instruction; and motivational support combined with reflective monitoring. The purpose of the study was to determine experimentally whether systematic implementation of these conditions produces significantly greater development of healthy lifestyle values among female university students than traditionally organized physical education.

MATERIALS AND METHODS

A controlled quasi-experimental pedagogical study was conducted during the 2023–2024, 2024–2025 and 2025–2026 academic years at Termiz State Pedagogical Institute, Kattakurgan State Pedagogical Institute and the Nukus branch of the Uzbekistan State University of Physical Education and Sport. The institutions represented different regional and educational contexts, which made it possible to examine the applicability of the proposed approach under varying organizational conditions.

A total of 380 female undergraduate students participated. Natural academic groups were retained to preserve the normal organization of the educational process. Participants were divided equally between an experimental group (EG, n=190) and a control group (CG, n=190): 65+65 participants at Termiz State Pedagogical Institute, 65+65 at Kattakurgan State Pedagogical Institute and 60+60 at the Nukus branch. Students assigned to special medical groups were not excluded; their physical load was adapted according to individual medical recommendations while the value-oriented and reflective components were retained.

The experiment consisted of diagnostic, formative and final stages. At the diagnostic stage, baseline levels of healthy lifestyle values and the statistical comparability of the groups were

established. During the formative stage, the developed pedagogical conditions were implemented in the experimental groups, while the control groups continued physical education according to the existing curriculum. At the final stage, the initial diagnostic procedure was repeated under comparable conditions. Participation was voluntary; sensitive health information was collected anonymously and diagnostic results did not influence academic grades.

Healthy lifestyle values were operationalized through four criteria. The cognitive criterion reflected knowledge and understanding of healthy lifestyle principles. The motivational-value criterion assessed acceptance of health as a personal value and internal motivation for physical activity. The activity-practical criterion reflected actual implementation of physical activity and healthy routines in everyday life. The reflective-control criterion assessed the ability to monitor one's condition, analyze difficulties, evaluate behaviour and make corrective decisions.

The diagnostic system combined knowledge tests and situational tasks, value and motivation questionnaires, physical activity records, reflective diaries, pedagogical observation, practical assignments and self-assessment instruments. Data from student self-reports were compared with activity records, pedagogical observations and reflective materials. Indicators obtained on different scales were converted to coefficients from 0 to 1. The integral coefficient was calculated as the arithmetic mean of the four criterion coefficients. Three levels were distinguished: high ($Ki \geq 0.70$), medium ($0.50 \leq Ki < 0.70$) and low ($Ki < 0.50$).

The experimental programme did not increase the number or duration of compulsory physical education classes, and the overall physical load remained comparable with the control groups. The first pedagogical condition created a health-supportive educational environment by replacing public comparison with individual-progress evaluation, using pair and small-group formats, peer support and moderate physical load. The second condition integrated seven value-oriented topics into existing lessons: health as a life value; understanding one's condition; physical activity norms and safety; daily routine, sleep and nutrition; psychological balance and stress; harmful habits and health risks; and an individual activity plan.

The third condition provided individualized and gender-sensitive instruction through two or three levels of task difficulty, meaningful choice among activity forms, self-monitoring of exercise intensity and adapted variants for students with health restrictions. The fourth condition linked motivational support with reflective monitoring. Students developed weekly activity plans, reviewed them regularly and used state-oriented, causal and action-oriented reflection questions. The "FaolQiz EDU" platform supported diagnostics, activity recording, healthy-routine monitoring, exercise selection, reflection and independent assignments, while remaining a supplementary rather than substitutive tool.

Results for each criterion were expressed as mean values with their errors (M±m). Between-group differences were analysed using Student's t-test: $t = |M1 - M2| / \sqrt{(m1^2 + m2^2)}$. With df=378, critical values were 1.97 at p=0.05, 2.59 at p=0.01 and 3.32 at p=0.001.

RESULTS

At baseline, the experimental and control groups were statistically comparable. The integral score was 54.8±2.1 in the experimental group and 55.1±2.2 in the control group. Across individual criteria, baseline t-values ranged from 0.10 to 0.22 and were not statistically significant ($p > 0.05$). This established the methodological precondition for attributing subsequent between-group differences to the implemented pedagogical organization.

The initial profile also revealed a pedagogically important gap between knowledge and behaviour. In the experimental group, the cognitive criterion was 56.4 points, whereas the activity-

practical criterion was 52.6 points. Thus, knowledge about healthy living was relatively better developed than its practical realization.

Table 1. Changes in healthy lifestyle value indicators (M±m)

Criterion	EG baseline (n=190)	EG final (n=190)	CG baseline (n=190)	CG final (n=190)
Cognitive	56.4 ± 2.1	82.3 ± 1.8	57.1 ± 2.3	64.5 ± 2.1
Motivational-value	54.8 ± 1.9	85.1 ± 1.6	55.2 ± 2.0	66.2 ± 2.0
Activity-practical	52.6 ± 2.4	80.7 ± 1.9	53.1 ± 2.2	62.8 ± 2.3
Reflective-control	55.3 ± 2.0	83.4 ± 1.7	54.9 ± 2.1	65.4 ± 2.1
Integral indicator	54.8 ± 2.1	82.9 ± 1.8	55.1 ± 2.2	64.7 ± 2.1

All four criteria improved markedly in the experimental group. The integral indicator increased by 28.1 points, from 54.8 to 82.9, which corresponded to 51.3% growth. In the control group it increased by 9.6 points, from 55.1 to 64.7, or 17.4%. The relative increase in the experimental group was therefore approximately three times greater than in the control group.

The greatest improvement was found in the motivational-value criterion: +30.3 points or 55.3%. The activity-practical criterion increased by 28.1 points (53.4%), the reflective-control criterion by 28.1 points (50.8%), and the cognitive criterion by 25.9 points (45.9%). The comparatively smaller cognitive growth is explained by its higher baseline value and therefore smaller reserve for improvement.

The intervention also changed the internal structure of the value profile. At baseline, knowledge was the leading component. At the end of the programme, motivational-value and reflective-control components became stronger. This suggests a transition from knowing about healthy living toward personally accepting, regulating and maintaining health-oriented behaviour.

Table 2. Final between-group comparison

Criterion	EG final	CG final	Difference	t	Significance
Cognitive	82.3 ± 1.8	64.5 ± 2.1	+17.8	6.44	p<0.001
Motivational-value	85.1 ± 1.6	66.2 ± 2.0	+18.9	7.38	p<0.001
Activity-practical	80.7 ± 1.9	62.8 ± 2.3	+17.9	6.00	p<0.001
Reflective-control	83.4 ± 1.7	65.4 ± 2.1	+18.0	6.66	p<0.001
Integral indicator	82.9 ± 1.8	64.7 ± 2.1	+18.2	6.58	p<0.001

Final t-values ranged from 6.00 to 7.38 and substantially exceeded the critical value of 3.32 for p=0.001. Thus, differences between the groups were statistically significant across all four criteria and the integral indicator. In coefficient terms, the experimental group increased from Ki=0.548 to Ki=0.829 and moved from the medium to the high level. The control group increased from Ki=0.551 to Ki=0.647 and remained within the medium level.

Pedagogical observation complemented the quantitative findings. Students in the experimental groups increasingly completed independent activity without external reminders; reflective diary entries progressed from descriptive statements toward causal analysis and behavioural correction; and peer encouragement became more visible. These qualitative changes were consistent with a movement from externally regulated participation toward greater self-management.

DISCUSSION

The results support the assumption that healthy lifestyle values cannot be formed through health-related information alone. The control group showed a modest improvement, but the gap between cognitive understanding and practical behaviour remained. The experimental programme produced substantially stronger changes in activity-practical and motivational-value outcomes. This agrees with previous evidence that university students may know the benefits of physical activity while remaining insufficiently active [3,4], and with systematic-review findings that multicomponent university interventions are more promising than isolated informational measures [6].

The strongest relative improvement in the motivational-value criterion is theoretically important. Self-determination theory proposes that sustainable behaviour is more likely when activity is internally regulated rather than maintained by external pressure [8]. In the experimental condition, students received meaningful choice, attainable goals and opportunities to experience personal progress. Public comparison was replaced by individual progress monitoring, which may explain the stronger motivational dynamics.

The findings also support gender-sensitive educational organization. In the present study, this concept did not reduce physical requirements. It involved psychological safety, differentiated load, respect for individual readiness, wider choice of activity forms and avoidance of public body- or performance-based comparison. The substantial increase in the activity-practical criterion suggests that reducing psychological and organizational barriers can facilitate real behavioural engagement.

The reflective-control criterion increased by 50.8%, confirming the importance of reflection in the transition from external pedagogical control toward self-regulation. Physical activity outside compulsory classes occurs largely beyond direct teacher supervision. Weekly plans, self-monitoring, reflective diaries and digital records therefore functioned not as formal reporting tools but as mechanisms for analysing behaviour and planning subsequent action.

The “FaolQiz EDU” platform was deliberately used within limited pedagogical boundaries. Digitalization itself was not treated as an educational outcome. The platform served to record, visualize and interpret individual dynamics and to support timely pedagogical adjustment. It did not replace physical activity or face-to-face interaction, and platform activity was not linked to academic grading.

The findings are also consistent with ecological approaches to health behaviour [10], because the intervention simultaneously addressed individual motivation, peer interaction, teacher communication, lesson organization and independent activity. The four pedagogical conditions were therefore conceived as an integrated system rather than separate techniques. Their overlapping influence, particularly on the motivational-value component, acted as reinforcement rather than duplication.

The study has several limitations. Part of the diagnostic information was obtained through self-report measures, which may be affected by socially desirable responding. This limitation was reduced through triangulation with pedagogical observation, practical assignments, diaries and digital records. Teachers implementing the intervention were aware of the study objectives. In addition, outcomes were assessed at the end of the formative programme, so the persistence of effects after graduation remains unknown. Finally, the sample was limited to female students in pedagogical and physical-education-related institutional contexts. Longitudinal follow-up and testing in non-pedagogical universities are therefore needed.

CONCLUSION

The study demonstrated that healthy lifestyle values among female university students can be substantially improved when physical education is organized as a purposeful value-oriented pedagogical process rather than solely as physical training. The proposed system comprised four interrelated conditions: a health-supportive educational environment; integration of healthy lifestyle values into regular physical education content; individualized and gender-sensitive instruction; and motivational support combined with reflective monitoring.

The experimental group's integral score increased from 54.8 to 82.9 points (51.3%), while the control group increased from 55.1 to 64.7 points (17.4%). Final differences between groups were statistically significant across all criteria at $p<0.001$. The greatest improvement occurred in the motivational-value component, followed by the activity-practical and reflective-control components.

The central pedagogical task is therefore not merely to inform female students about healthy behaviour, but to create conditions in which health-related knowledge acquires personal meaning, is translated into everyday activity and becomes subject to conscious self-regulation. Such organization allows physical education in higher education to contribute to sustainable health-oriented behaviour beyond the compulsory class.

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WAYS OF USING ARTISTIC AND PEDAGOGICAL LITERATURE TO DEVELOP THE PROFESSIONAL AND AESTHETIC CULTURE OF FUTURE TEACHERS

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Abstract: *This article examines the theoretical, methodological, and instructional foundations for developing the professional and aesthetic culture of future teachers through the use of artistic and pedagogical literature. Professional and aesthetic culture is characterized as a complex professional quality that integrates a teacher’s ability to perceive beauty, recognize the aesthetic dimensions of pedagogical phenomena, harmoniously organize speech and interpersonal communication, demonstrate a sensitive emotional attitude toward students, and adhere to aesthetic criteria in pedagogical practice. The article analyzes the potential of artistic and pedagogical literature for fostering the professional and aesthetic development of future teachers, with particular attention to teacher characters, teacher–student relationships, psychological experiences, moral choices, communication culture, aesthetic descriptions, and educational situations portrayed in literary works.*

Keywords: *future teacher, professional and aesthetic culture, artistic and pedagogical literature, teacher character, aesthetic perception, professional image, pedagogical reflection, communication culture, aesthetic taste, educational values.*

INTRODUCTION

Pedagogical education requires not only equipping prospective teachers with professional knowledge and methodological skills, but also fostering their moral, emotional, communicative, and aesthetic development. A teacher’s personal culture is manifested in various aspects of professional practice, including teaching style, speech, dress and appearance, interpersonal etiquette, classroom environment management, attitudes toward students, assessment practices, and everyday pedagogical decision-making. “The concept of professional-aesthetic culture encompasses a teacher’s ability to perceive and appreciate beauty, harmony, proportion, refinement, expressiveness, and spiritual meaning within the context of professional activity” [1; Baynazarova, N. Kh.]. Every component of the pedagogical process possesses an aesthetic potential. The teacher’s tone of voice, use of the board, manner of presenting instructional material, culture of attentive listening, ways of posing questions, personal appearance, classroom order, interaction with students, and proportionality in behavior all contribute to an educational and aesthetic impact. Therefore, the professional-aesthetic culture of prospective teachers has a profound influence on their future pedagogical practice.

Professional-aesthetic culture is also manifested through the balance between the teacher’s inner qualities and external appearance. A teacher’s appearance, speech, body movements, facial expressions, tone of voice, and behavioral patterns are reflected in their overall conduct, while such external conduct exerts a formative influence on students. Consequently, particular attention should be given to the development of aesthetic culture within the professional preparation of prospective teachers. “Works of literary and pedagogical fiction provide significant opportunities

for accomplishing this task" [10; Kochkinova, M. N.]. Such works portray concepts such as teacher–student relationships, students' inner worlds, educational conflicts, pedagogical mistakes, professional courage, compassion, attention, patience, justice, beauty, and humanity through vivid characters and life-based situations.

While reading literary and pedagogical works, students observe events, empathize with the psychological experiences of the characters, evaluate pedagogical decisions, perceive the impact of dialogues, visualize the educational environment depicted in the narrative, and attempt to place themselves within the situations presented. This process creates a natural context for the development of professional-aesthetic perception.

LITERATURE REVIEW AND METHODS

The role of the teacher's image is particularly significant in the development of professional and aesthetic culture. The image of a teacher portrayed in a literary work provides students with an opportunity to observe and critically reflect on different professional identities and models of pedagogical behavior. Some literary characters are distinguished by patience, moral integrity, eloquence, and genuine attention to their students. Other characters, in contrast, reveal the consequences of indifference, rudeness, lack of aesthetic sensitivity, or pedagogical mistakes. By comparing such representations, students are able to develop and gradually shape their own professional ideals.

Another important potential of literary and pedagogical works lies in enriching the professional speech of future teachers. As noted by Møller-Skau, "literary texts reveal the expressive power of words, the meaning conveyed through intonation, the significance of silence, and the psychological impact of dialogue" [6; Møller-Skau, M.]. Exposure to such linguistic and aesthetic models enables prospective teachers to learn how to apply expressive and culturally appropriate forms of communication in their professional interactions.

Professional and aesthetic culture is also manifested in the creation of an effective and aesthetically appropriate educational environment. Classroom organization, the selection and arrangement of visual materials, color harmony, the quality and presentation of writing on the board, the structure of instructional materials, the ways in which students' work is displayed, and the overall psychological atmosphere of the classroom constitute important components of pedagogical aesthetics. Descriptions of schools, classrooms, teachers' rooms, and educational environments found in literary works provide rich material for analytical reflection in this regard.

The professional image of a teacher is closely associated with his or her internal values and ethical orientations. A teacher who appreciates beauty, respects human dignity, and maintains harmony between speech and behavior can serve as a powerful educational and moral model for students. From this perspective, the development of professional and aesthetic culture is intrinsically connected with professional conduct, pedagogical ethics, and personal responsibility.

The development of future teachers' professional and aesthetic culture through literary and pedagogical works requires the development of appropriate methodological foundations and instructional approaches. Taking this aspect into consideration, we propose the following method.

This process creates favorable conditions for the development of professional and aesthetic perception among prospective teachers.

The professional image method

This method is designed to connect the aesthetic impact of a literary-pedagogical work with students' prospective professional identities. Within this approach, students analyze the pedagogical character, speech, interpersonal communication, environment, behavior,

psychological experiences, and aesthetic details represented in a literary text from the perspective of professional pedagogical criteria. Based on this analysis, they subsequently draw conclusions about their own prospective professional image as teachers.

The method begins with identifying students' initial aesthetic impressions of the literary-pedagogical work. Students determine which description, dialogue, character, or situation has made the strongest impression on them and examine both the external and internal characteristics of the pedagogical figure represented in the work. "Each conclusion concerning the character should be substantiated by a specific event, dialogue, or action presented in the text, while the professional image of the pedagogical character should be analyzed as an integrated whole" [9; Yaqubova, D. X.]. This process contributes to deepening prospective teachers' understanding of their professional ideal.

The aesthetic and pedagogical conflicts presented in the literary work are then identified. For example, students may analyze the contradiction between a teacher's intellectual competence and rude communication, the discrepancy between eloquent speech and practical indifference, or the inconsistency between external orderliness and internal emotional detachment. Analyzing such aesthetic contradictions enables students to understand that professional image encompasses a much broader range of qualities than merely external appearance.

Following this stage, students compare themselves with the literary character. This comparison facilitates self-awareness, self-evaluation, and the identification of pathways for professional development. Based on their analysis, students create a practical product. Such a product may take the form of a teacher's professional-aesthetic code, a pedagogical image map, a project for an aesthetically conducive classroom environment, a model of professional speech, an aesthetic solution to a pedagogical situation, an ideal teacher portrait, a personal professional development plan, or a reflective

RESULTS

Professional-aesthetic culture can be characterized as an integrative professional quality encompassing the ability to perceive beauty, recognize aesthetic features within the pedagogical environment, maintain harmony between speech and behavior, organize the educational process with a sense of aesthetic appropriateness, and demonstrate subtle emotional sensitivity toward learners. The proposed methodology begins with the aesthetic perception of a literary text and proceeds through the analysis of a pedagogical character, assessment of professional appearance and conduct, identification of aesthetic contradictions, reflective self-assessment, and the development of practical solutions. Within this process, the student initially provides a general description of the pedagogical character represented in the literary text; however, a limited approach to identifying its aesthetic content may be observed. At the subsequent stages, the student identifies specific aesthetic and professional characteristics of the character and evaluates forms of speech and interpersonal communication. At a more advanced level, the student conducts an in-depth analysis of the pedagogical image, identifies aesthetic contradictions, draws conclusions based on contemporary pedagogical situations, and independently interprets the literary character. The student also critically evaluates their own professional image and develops an original pedagogical-aesthetic solution.

For the purpose of developing professional-aesthetic culture, the selection of literary works should be based on several essential criteria: the presence of pedagogical relationships or educational content within the work; sufficient richness of the pedagogical character for professional-aesthetic analysis; the presence of emotional impact, psychological experiences, or

moral choices; the appropriateness of the text to students' age and level of professional preparation; the potential of the work to encourage profound reflection on the image of the teacher; the aesthetic expressiveness of the text; and the possibility of relating the literary work to contemporary pedagogical situations.

"Working with literary and pedagogical texts contributes to the professional-aesthetic development of future teachers" [7; Olimov, T. X.]. First and foremost, students begin to perceive the teaching profession as an aesthetic phenomenon. In the subsequent stages, students observe various professional images through literary characters. This enables them to understand what kind of teacher they aspire to become and which professional characteristics they should avoid. Literary and pedagogical works also enhance students' emotional sensitivity. Through artistic representation, students can gain a deeper understanding of how a particular word that profoundly affects a learner, a teacher's single act of attention, or even the psychological meaning conveyed through silence may influence the learner's inner world.

"The aesthetic impact of a literary text contributes to the development of students' pedagogical reflection" [8; Pizzolante, M.]. Students compare their present professional image with their prospective professional ideal. In this way, literary and pedagogical works become an active and meaningful source of professional-aesthetic development.

DISCUSSION

The development of the professional and aesthetic culture of prospective teachers occupies a significant place in teacher education. This is because teachers influence their students through every word they utter, every action they take, their appearance, and their interpersonal attitudes. A teacher's aesthetic culture brings elegance, order, harmony, and spiritual depth to pedagogical practice. Literary and pedagogical works provide rich opportunities for developing these qualities. A pedagogical character depicted in a literary work can contribute to the formation of students' professional ideals; dialogues can enrich their communicative and speech culture; and the characters' psychological experiences can foster empathic sensitivity. In the process of developing professional and aesthetic culture, merely providing students with ready-made conclusions does not ensure effective outcomes. Students need to independently observe and interpret literary characters, formulate questions, evaluate their qualities, and develop their own conclusions.

The personal example of the educator also plays an important role in the formation of professional and aesthetic culture. A university instructor serves as a model for students through their speech, interpersonal communication, organization of the learning process, and personal appearance. Therefore, it is essential to establish a safe and respectful environment for the exchange of ideas during educational activities. Since aesthetic taste is closely associated with personal experience, the emergence of diverse perspectives is natural. What is particularly important is that each opinion should be substantiated in accordance with pedagogical and aesthetic criteria. As noted by Marasulov, "raising literary characters to the level of ideals and evaluating them one-sidedly is not methodologically appropriate" [5; Marasulov, B. Sh.]. Recognizing the strengths, complexities, and controversial aspects of each character contributes to the development of students' critical thinking.

Professional and aesthetic culture influences all areas of pedagogical practice. It manifests itself in lesson design, communication, assessment, educational and formative discussions, interaction with parents, and collaborative work within a professional community. Literary and pedagogical works constitute a powerful methodological tool for developing the professional and

aesthetic culture of prospective teachers, as they facilitate the integration of knowledge, emotions, values, reflection, and practical activity.

CONCLUSION

Developing the professional and aesthetic culture of prospective teachers is one of the important objectives of teacher education. Professional and aesthetic culture encompasses a teacher's ability to perceive beauty, recognize harmony within the pedagogical environment, maintain appropriate standards of speech and conduct, demonstrate sensitivity to students' psychological and emotional states, and consciously shape their professional image. "Artistic and pedagogical literature provides a rich substantive, emotional, and reflective resource for this process" [3; Freitas, A., Pereira, F.]. The pedagogical characters, dialogues, problematic situations, psychological experiences, aesthetic descriptions, and moral choices presented in such works enrich students' professional and aesthetic perspectives. The purposeful and systematic integration of artistic and pedagogical literature into the educational process can therefore be regarded as an important didactic means of influencing the professional development of prospective specialists.

Pedagogical situations, teacher and learner characters, moral choices, psychological experiences, and social relationships portrayed in such works help students develop a deeper understanding of professional phenomena. In the process of analyzing literary works, students develop the ability to evaluate pedagogical realities from different perspectives, identify the underlying causes of human behavior, formulate well-grounded responses to problematic situations, and draw meaningful moral and ethical conclusions.

Characters and real-life situations depicted in literary texts enhance students' pedagogical sensitivity and prepare them to understand learners' psychological states, needs, interests, and individual characteristics. On this basis, prospective teachers develop the ability to listen attentively to others, express their thoughts tactfully, make balanced decisions in conflict situations, comply with the norms of pedagogical ethics, and establish effective communication. Evaluating the behavior of literary characters according to pedagogical criteria also helps students clarify their professional positions and strengthens their sense of conscious responsibility toward teaching practice.

"Working with artistic and pedagogical sources also contributes to the development of aesthetic thinking, imaginative reflection, emotional perception, and creative approaches" [2; Devonas Hoffmann]. By relating the pedagogical ideas presented in literary works to contemporary educational challenges, students gain an opportunity to integrate professional knowledge with life experience. As a result, an internal need is cultivated to analyze their own professional activities, recognize personal and professional shortcomings, explore new pedagogical experiences, and engage in continuous self-development.

Thus, artistic and pedagogical literature serves not only as a source for expanding the knowledge base of prospective teachers but also as an influential educational and developmental tool that contributes to the improvement of their professional taste, ethical perspectives, pedagogical thinking, and humanistic orientation.

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DEVELOPING DIGITAL COMPETENCY OF PRE-SERVICE INFORMATICS TEACHERS THROUGH MOBILE TECHNOLOGY-BASED ELECTRONIC LEARNING RESOURCES: AN INTEGRATED CONCEPTUAL FRAMEWORK

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Abstract. *This paper proposes an integrated conceptual framework for developing digital competency among pre-service informatics teachers through mobile technology-based electronic learning resources (ELR). The framework synthesises three established models — TPACK (Technological Pedagogical Content Knowledge), DigCompEdu (Digital Competence Framework for Educators), and SAMR (Substitution, Augmentation, Modification, Redefinition) — into a unified three-layer system. The first layer employs TPACK to integrate content, pedagogical, and technological knowledge through mobile ELR. The second layer maps educator proficiency levels from A1 (Beginning) to C2 (Pioneer) using the DigCompEdu framework, linking each level to specific mobile ELR activities. The third layer applies the SAMR model to assess the depth of technology integration at each proficiency stage. A gap analysis demonstrates that no single existing framework comprehensively addresses knowledge integration, proficiency-level identification, and technology integration depth simultaneously, nor has any been adapted specifically for mobile ELR contexts. The proposed model addresses these gaps by offering a systematic approach to curriculum design, ELR selection, and professional development planning for informatics teacher education programmes. An application scenario illustrates how the model can be operationalised in practice. Limitations and directions for future empirical validation are discussed.*

Keywords: *digital competency; TPACK; DigCompEdu; SAMR; mobile learning; electronic learning resources; pre-service teacher education; informatics education; conceptual framework; integrated model*

1. Introduction

The rapid development of digital technologies is transforming education systems worldwide. Mobile learning technologies, interactive platforms, and artificial intelligence-based educational tools are becoming integral components of contemporary instruction. Consequently, the issue of developing digital competency among pre-service informatics teachers has acquired particular urgency. Digital competency extends beyond the mere ability to use technological tools — according to the DigCompEdu framework, it encompasses the capacity to enhance educational quality, improve student learning outcomes, and ensure continuous professional development through digital means [1]. The UNESCO ICT Competency Framework for Teachers (2018) similarly requires educators to acquire digital skills at three progressive stages: knowledge acquisition, knowledge deepening, and knowledge creation [2].

In Uzbekistan, the national strategy "Digital Uzbekistan 2030" and recent legislative reforms in education have prioritised the integration of digital technologies and digital learning resources across all levels of the education system. At the same time, demand for mobile learning technologies and mobile ELR in higher education institutions remains high, as surveys conducted among students at Kokand State University indicate a clear preference for mobile-based digital learning resources.

Several conceptual approaches to developing digital competency are widely employed in contemporary pedagogical research, including the TPACK model, the DigCompEdu competency framework, and the SAMR model. The TPACK model is grounded in the principle that technology achieves maximum effectiveness when harmonised with content and pedagogy, rather than functioning as a supplementary tool [3]. The DigCompEdu framework defines six proficiency levels for educators, ranging from A1 to C2 [1]. The SAMR model provides a means of assessing the depth of technology integration [4], [5]. However, each of these frameworks addresses only one dimension of the problem: TPACK integrates knowledge types but does not measure competency levels; DigCompEdu identifies proficiency levels but does not address instructional methodology; and SAMR assesses technology integration stages but does not account for pedagogical and content knowledge.

Mobile technology-based electronic learning resources — including LearningApps, Moodle Mobile, and Google Classroom — are increasingly recognised as important tools for developing digital competency [6], [7]. Research confirms that integrating mobile devices into instruction enhances student performance [8]. However, the majority of existing studies are limited to describing the capabilities of individual tools and do not systematically link them to a comprehensive pedagogical framework for digital competency development.

The primary aim of this paper is therefore to propose an integrated conceptual model that combines the TPACK, DigCompEdu, and SAMR frameworks within the context of mobile electronic learning resources. The model is designed for the systematic development of digital competency among pre-service informatics teachers. The scientific novelty of this work lies in the fact that three frameworks are integrated for the first time into a unified system, and a conceptual foundation adapted to the mobile ELR context is proposed.

2. Literature Review

2.1. Digital competency in teacher education

Digital competency is recognised as one of the essential professional qualities required of educators in contemporary education systems, particularly those specialising in informatics. The DigCompEdu framework, developed by the European Commission, systematises educators' digital competency across six areas: professional engagement, digital resources, teaching and learning, assessment, empowering learners, and facilitating learners' digital competence [1]. This framework defines digital competency not merely as a technical skill but as the capacity to enhance educational quality through digital means. The UNESCO ICT Competency Framework for Teachers (2018) examines educators' digital proficiency across three stages: knowledge acquisition, knowledge deepening, and knowledge creation [2]. As Falloon (2020) emphasises, pre-service teacher education programmes frequently limit digital competency to the teaching of technical skills, whereas contemporary approaches require an integrated system combining pedagogical, technological, and reflective capabilities [9].

2.2. TPACK as a theoretical foundation

The TPACK model, developed by Mishra and Koehler (2006), conceptualises teacher knowledge as the intersection of three fundamental domains: content knowledge (CK), pedagogical knowledge (PK), and technological knowledge (TK) [3]. The model's central premise is that technology in education should not function as a standalone supplement but should be applied in harmony with content and pedagogy. Voogt et al. (2013) conducted a systematic review of TPACK research and found that while the model is widely adopted in teacher education programmes, its practical implementation methods remain insufficiently developed [10]. Schmid et al. (2020) identified a moderate positive correlation between TPACK and learning outcomes in their meta-analysis [11]. However, a key limitation of the TPACK model is that it does not explicitly define competency levels or indicate the stages at which technology integration occurs (Figure 1).

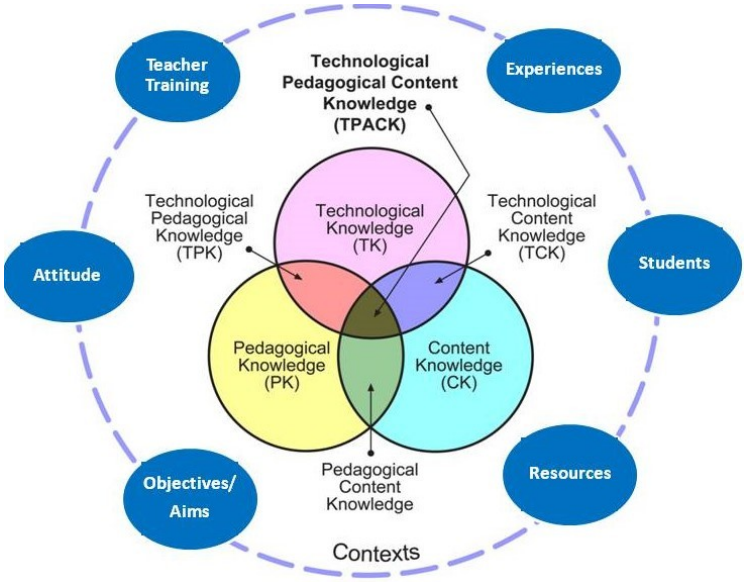


Figure 1. Intersection of technological, pedagogical, and content knowledge in the TPACK model.

2.3. DigCompEdu and SAMR as complementary frameworks

The DigCompEdu framework assesses educators' digital competency across six levels, from A1 (Beginning) to C2 (Pioneer) [1]. This framework clearly identifies "where the educator stands" but does not provide detailed guidance on how to integrate technology into instruction. The SAMR model assesses the depth of technology use across four stages: Substitution, Augmentation, Modification, and Redefinition [4], [5]. Hamilton et al. (2016) critically analysed the SAMR model, noting that while its strength lies in visualising technology integration, its theoretical foundations are insufficiently developed [5]. Crucially, DigCompEdu indicates "at which level the educator is", while SAMR shows "how technology is being used", but neither fully addresses instructional methodology or knowledge integration — a function that TPACK fulfils.

2.4. Mobile learning resources and their role in education

Mobile learning (m-learning) has become an integral part of contemporary education. Crompton (2013) defines mobile learning as "the learning process carried out through personal electronic devices across diverse contexts" [6]. A meta-analysis by Sung et al. (2016) found that integrating mobile devices into instruction improves student performance at a moderate level (effect size = 0.52) [8]. Kukulska-Hulme et al. (2009) highlight the innovative aspects of mobile learning, including flexibility, continuous access, and the ability to provide personalised learning pathways [7]. However, the majority of existing studies are limited to describing the technical

capabilities of individual platforms or applications. A systematic approach that defines the role of mobile learning resources within a comprehensive pedagogical model for digital competency development has not yet been sufficiently developed.

3. Gap Analysis and Rationale

The literature review presented above demonstrates that existing frameworks for developing digital competency make individually valuable contributions, but each addresses only one facet of the problem. Table 1 presents a comparative analysis of the coverage boundaries of the three principal frameworks.

Table 1. Comparative analysis of existing frameworks

Criterion	TPACK	DigCompEdu	SAMR
Knowledge integration (CK, PK, TK)	✓	—	—
Competency level identification (A1–C2)	—	✓	—
Technology integration stage assessment	—	—	✓
Instructional methodology guidance	Partial	—	—
Adaptation for mobile ELR	—	—	—

As Table 1 illustrates, no single framework comprehensively covers all dimensions of digital competency development [10], [5]. No existing study has proposed an integrated model combining these three frameworks into a unified system. Furthermore, none of the frameworks has been specifically adapted for the context of mobile electronic learning resources [6], [8]. This paper therefore proposes an integrated conceptual model that synthesises the TPACK, DigCompEdu, and SAMR frameworks, adapted for mobile ELR.

4. Proposed Framework: An Integrated Conceptual Model

4.1. Overall structure of the model

The proposed integrated conceptual model comprises three layers, each performing the core function of one existing framework. The first layer — TPACK integration — demonstrates how the three types of teacher knowledge (CK, PK, TK) are combined through mobile ELR. The second layer — the DigCompEdu competency map — identifies the educator's digital proficiency level and defines a developmental trajectory. The third layer — the SAMR progression pathway — assesses the depth of technology use at each proficiency level. At the centre of the model stand mobile electronic learning resources, which serve as the practical connective tissue binding the three layers together. This model differs from existing frameworks in two respects: first, it treats the three frameworks not as competing alternatives but as complementary components of a unified system; second, it links theoretical frameworks to specific mobile learning tools (Figure 2).

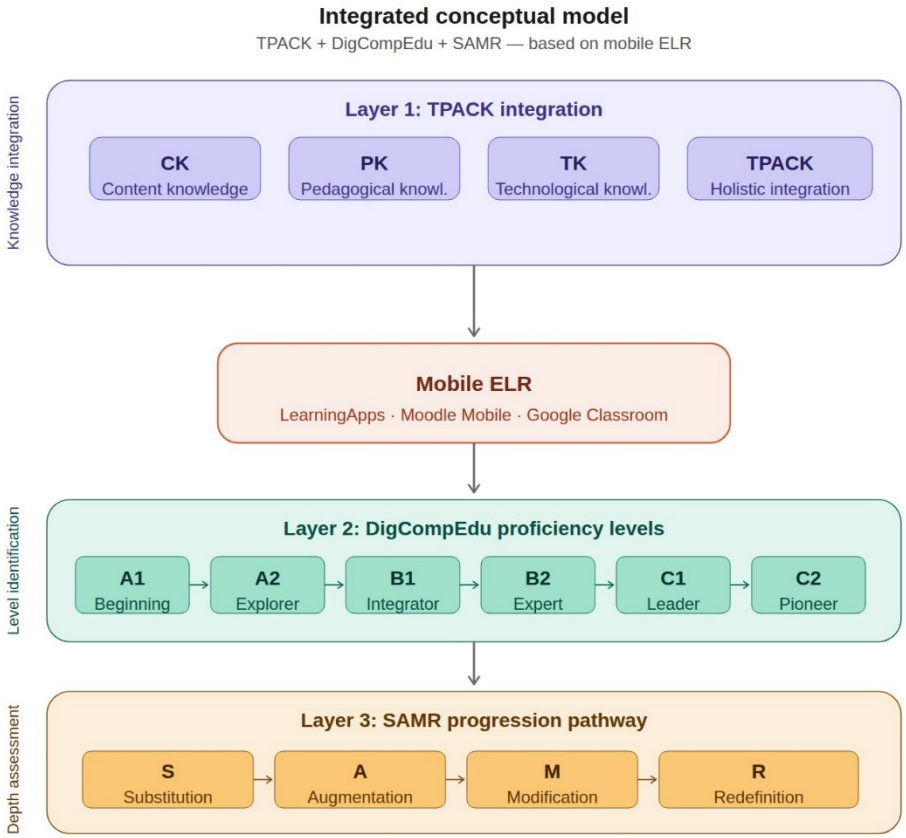


Figure 2. Integrated conceptual model: TPACK + DigCompEdu + SAMR based on mobile ELR.

4.2. Layer 1: TPACK integration through mobile ELR

Each component of the TPACK model is operationalised through mobile electronic learning resources as follows [3]. Content Knowledge (CK) involves delivering subject content interactively — for example, creating interactive exercises covering core informatics concepts on the LearningApps platform. Pedagogical Knowledge (PK) entails adapting instructional strategies to students' age, level, and individual needs — for example, developing differentiated task systems through Moodle Mobile. Technological Knowledge (TK) encompasses the skills required to effectively utilise the didactic capabilities of mobile applications — for example, organising classroom management and assessment through Google Classroom.

Table 2. Relationship between TPACK components and mobile ELR

TPACK component	Function	Mobile ELR example
CK (Content knowledge)	Interactive subject content delivery	LearningApps, Khan Academy
PK (Pedagogical knowledge)	Adapting instructional strategies	Moodle Mobile, Google Classroom
TK (Technological knowledge)	Effective use of mobile tools	All mobile platforms
TCK	Creating interactive learning materials	LearningApps + subject content
TPK	Linking mobile tools to pedagogy	Google Classroom + assessment
TPACK	Holistic integration of all three	Complex project-based tasks

	domains	

The intersection domains of TPACK are also of significant importance: Technological Content Knowledge (TCK) manifests in the creation of interactive learning materials, Technological Pedagogical Knowledge (TPK) in linking mobile tools to instructional strategies, and full TPACK in the holistic application of all three domains.

4.3. Layer 2: DigCompEdu competency map

The second layer of the model identifies the educator's digital proficiency level and specifies which mobile ELR activities are appropriate at each level [1]. At the A1 (Beginning) level, the educator begins using existing digital tools — for example, distributing ready-made materials via Google Classroom. At the A2 (Explorer) level, the educator experiments with tool functionalities — for example, creating simple interactive exercises on LearningApps. At the B1 (Integrator) level, tools are applied systematically within instruction — for example, designing a module structure on Moodle Mobile. At the B2 (Expert) level, individualised learning activities are designed — for example, developing differentiated task systems. At the C1 (Leader) level, the educator effectively manages the learning platform and supports colleagues. At the C2 (Pioneer) level, the educator develops and disseminates new digital teaching methodologies.

Table 3. DigCompEdu proficiency levels and mobile ELR activities

Level	Description	Mobile ELR activity
A1 — Beginning	Using existing tools	Distributing materials via Google Classroom
A2 — Explorer	Experimenting with tool functions	Creating simple exercises on LearningApps
B1 — Integrator	Systematic application	Designing modules on Moodle Mobile
B2 — Expert	Designing individualised activities	Developing differentiated task systems
C1 — Leader	Managing the platform	Systematically organising the learning process
C2 — Pioneer	Creating new methodologies	Developing original mobile ELR

4.4. Layer 3: SAMR progression pathway

The third layer of the model assesses the depth of technology use at each competency level through the SAMR model [4], [5]. At the Substitution stage, technology simply replaces a traditional tool — for example, distributing a textbook in PDF format. At the Augmentation stage, technology introduces functional improvements — for example, electronic materials with embedded interactive quizzes. At the Modification stage, tasks are fundamentally redesigned — for example, students collaboratively develop a project through a mobile application. At the Redefinition stage, technology creates new learning experiences that were previously impossible — for example, students themselves develop interactive learning resources for their peers. Importantly, SAMR stages develop in parallel with DigCompEdu levels: at A1–A2 levels, Substitution and Augmentation predominate; at B1–B2, Modification begins; and at C1–C2, Redefinition emerges.

Table 4. Relationship between DigCompEdu levels and SAMR stages

DigCompEdu level	SAMR stage	Example
A1–A2	Substitution / Augmentation	PDF distribution, simple quizzes
B1–B2	Augmentation / Modification	Interactive exercises, collaborative projects
C1–C2	Modification / Redefinition	Students create their own ELR

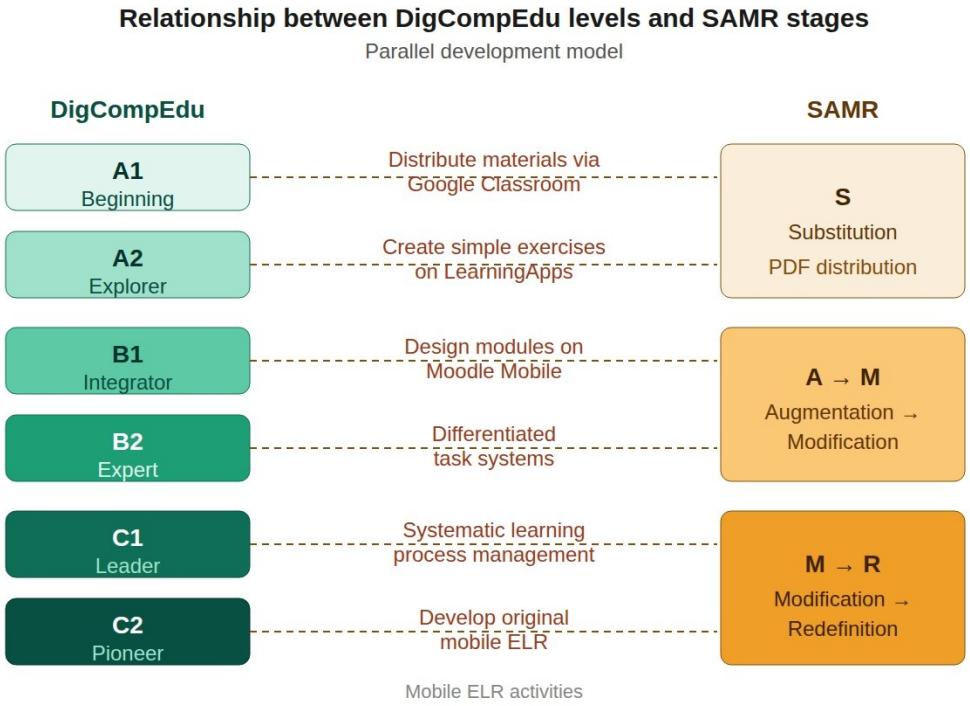


Figure 3. Parallel development model: DigCompEdu proficiency levels and SAMR stages.

4.5. Application scenario

To illustrate the practical application of the model, the following scenario is considered. In teaching the topic "Developing Pedagogical Software Tools" within the course "Creation of UI/UX Design and Structure for Multimedia Textbooks and Educational Websites (WordPress, Joomla)", the educator first identifies their DigCompEdu level — for example, B1 (Integrator). At this level, the TPACK model requires the integration of subject content (CK — software development principles) with pedagogical strategy (PK — step-by-step instruction) and technological tools (TK — interactive exercises on LearningApps). According to the SAMR model, the educator is operating at the Augmentation stage — interactive elements have been added, but the task structure remains conventional. As a developmental pathway, the educator is advised to progress to B2 level and achieve the Modification stage by creating a system of differentiated tasks adapted to students' individual needs on Moodle Mobile.

5. Discussion

The proposed integrated conceptual model opens a number of theoretical and practical possibilities. First, from a theoretical perspective, this model integrates three principal frameworks in the field of digital competency into a unified system for the first time. In existing literature, TPACK, DigCompEdu, and SAMR are typically studied in isolation [10], [5]. The present model treats them not as competing alternatives but as complementary frameworks: TPACK provides the theoretical foundation for knowledge integration, DigCompEdu defines the developmental

trajectory, and SAMR assesses the quality of technology use. This approach aligns with Falloon's (2020) argument that digital competency should be understood as a multidimensional process [9].

Second, from a practical standpoint, the model can serve as a guideline for curriculum design. Programme designers can use it to specify which competency level each module targets, which TPACK components it develops, and which SAMR stage it aims to achieve. Moreover, the model functions as a criterion for selecting and evaluating mobile ELR — identifying which TPACK component each tool develops and which SAMR stage it corresponds to.

Third, the model is of particular relevance for pre-service informatics teachers. In the field of informatics, technological knowledge (TK) is expected to be stronger than in other disciplines. The first layer of the model (TPACK) is specifically directed at addressing this challenge — linking technological knowledge with pedagogical and content knowledge [3].

The model also has limitations. First, as a conceptual model, it has not yet been empirically tested. Future research should experimentally verify the model's practical effectiveness. Second, the model draws on three principal frameworks and does not encompass other important approaches — such as the UNESCO AI Competency Framework (2024) or the PIC-RAT model. There is scope for future extension. Third, the mobile ELR examples cited in the tables may become outdated over time — the model should be grounded in pedagogical principles rather than specific platforms.

6. Conclusion

This paper proposed an integrated conceptual model for developing digital competency among pre-service informatics teachers through mobile technology-based electronic learning resources. The model combines the TPACK, DigCompEdu, and SAMR frameworks as three layers: TPACK provides the theoretical foundation for knowledge integration, DigCompEdu identifies the educator's competency level and defines the developmental trajectory, and SAMR assesses the depth of technology use. Mobile ELR stand at the centre of the model, serving as the practical mechanism connecting theoretical frameworks to the instructional process.

The principal scientific contributions of this paper are threefold: first, three frameworks have been examined within a unified integrative system for the first time; second, the coverage boundaries of each framework have been systematically analysed and their complementary potential demonstrated; third, a conceptual foundation adapted to the mobile ELR context has been proposed.

Future research directions include: empirical testing of the model under experimental conditions, comparative studies across multiple higher education institutions, and investigation of the potential for incorporating artificial intelligence-based adaptive learning elements into the model.

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THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR DEVELOPING PRE-SERVICE PRIMARY SCHOOL TEACHERS' SKILLS IN USING CONCEPTUAL TABLES AND GRAPHIC ORGANIZERS IN MOTHER TONGUE LANGUAGE EDUCATION

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Abstract. Background. *Conceptual tables and graphic organizers are among the most extensively researched external representations in education, and their effects on pupils are well documented. The preparation of the teachers who design and mediate them has received far less theoretical attention, particularly in primary mother tongue language education.*

Purpose. *The study substantiates the theoretical and methodological foundations for developing pre-service primary school teachers' skills in using conceptual tables and graphic organizers in mother tongue language education.*

Materials and methods. *The study is conceptual and methodological rather than empirical. A purposively assembled corpus of international and national scholarship, prioritising publications from 2020 onwards alongside foundational theoretical works, was examined through theoretical, comparative, document and content analysis, synthesis, generalisation, and pedagogical modelling. Seven theoretical positions were integrated into the analytical framework.*

Results. *The reviewed evidence supports a design-and-mediation rather than a tool-provision reading of visual organisation, and therefore presupposes a teacher-level capability that the literature has not theorised. Visual information organisation is specified as a functional-structural component of primary teachers' methodological competence in mother tongue education, comprising cognitive–knowledge, practical–activity, methodical–pedagogical, and reflective–evaluative blocks ordered by the chain cognitive → practical → methodical → reflective. Its formation is specified through six principles, five stages, and three levels defined by block.*

Conclusions. *The foundations supply an operational design logic that universities can adopt within existing programme structures and that subsequent empirical work can test.*

Keywords: *conceptual tables; graphic organizers; pre-service primary school teachers; mother tongue language education; competency-based teacher education; visual information organisation; instructional design; pedagogical modelling*

1. Introduction

The competency-based reorganisation of higher education has redefined teacher preparation around a single question: what should a graduate be able to do? For teacher education this shift has been consequential, because knowing a subject and being able to make that subject learnable are different accomplishments. Shulman's distinction between content knowledge and

pedagogical content knowledge, and its later elaboration into specialised content knowledge for teaching, established that the transformation of disciplinary material into instructionally usable form is a domain of professional knowledge with its own structure [1, 2]. Comparative analysis of high-performing systems shows that where preparation is coherent, this transformational work is taught and assessed rather than absorbed incidentally [3].

Mother tongue language education in primary school makes this demand acute. Its content is dense with categorical, hierarchical, and contrastive structure — phonemes and their graphic realisations, morphemic composition, parts of speech and their grammatical categories, syntactic relations, text types, orthographic rules and their exceptions [4]. Much of this structure is relational rather than enumerative: not a list of facts to be recalled but a system of contrasts to be understood. Yet the learners are children whose working memory, decoding fluency, and metalinguistic awareness are still developing. The teacher therefore faces a persistent design problem: how to render systematically organised linguistic content accessible to learners who cannot extract that organisation from continuous prose unaided.

Conceptual tables and graphic organizers address this problem directly. Both are external spatial representations that make relational structure visible: tables through the intersection of rows and columns, which forces explicit comparison; organizers through nodes and links, which display hierarchy, sequence, causation, and conceptual association. Their empirical record is substantial. Syntheses of concept and knowledge mapping, of text-structure instruction, and of graphic organizer intervention converge on moderate to large average effects across content areas and learner populations [5, 6, 7]. Within language education, meta-analysis reports large aggregate effects on achievement, and studies in first- and second-language reading report benefits for comprehension and recall of text-based relations [8, 9, 10]. The most recent synthesis distinguishes learner-generated from instructor-provided organizers, finds both effective, and documents publication bias and inflated classroom-based estimates [11].

Against this background an asymmetry emerges. Almost all of this research treats the organizer as an independent variable applied to learners; the teacher appears, if at all, as an implementation condition. Yet the same syntheses establish that effectiveness is conditional — on the fit between the organizer's structure and the content's structure, on the level of in-task guidance, and on learners' prior knowledge [12, 13, 14, 15]. Conditional effectiveness makes the instrument a matter of professional judgement rather than routine application. A teacher given a bank of templates but not the analytic capacity to match structure to content, calibrate support, and read pupils' completed organizers diagnostically has been equipped with a resource, not with a competence.

Evidence from adjacent areas suggests the concern is not hypothetical. Reviews of pre-service teachers' digital competence consistently find adequate performance on routine operational tasks alongside distinct weaknesses in content creation and pedagogical integration — precisely the design-level capabilities that distinguish professional from personal use of a tool [16, 17]. Within Uzbekistan the instrument has begun to attract attention [18], but this literature is small, directed at general instructional use rather than mother tongue methodology, and largely descriptive.

The **research problem** is accordingly the absence of a consolidated theoretical and methodological foundation for developing pre-service primary teachers' skills in using conceptual tables and graphic organizers in mother tongue education. The **aim** is to substantiate such a foundation. Three **research questions** guide the study. RQ1: What theoretical positions justify

treating these skills as an object of systematic development in initial teacher education? RQ2: How should they be located within the professional competence structure of the pre-service primary teacher of the mother tongue? RQ3: What integrated methodological foundation follows from that analysis?

Two boundaries are set at the outset. The article is theoretical and methodological; it reports no experimental results. And it proposes no new competence model: visual information organisation is treated throughout as a functional-structural component of methodological competence, not as a freestanding professional competence.

2. Materials and Methods

2.1 Design

The study is a theoretical and methodological investigation. This design is defended on two grounds. First, logical priority: an empirical trial conducted without a specified construct would operationalise it arbitrarily and produce uninterpretable findings. Second, the state of the evidence: the learner-level effectiveness of visual organisation is well documented, while the teacher-level capability its conditionality presupposes is not. The contribution needed is therefore interpretive and constructive.

2.2 Analytical framework

Seven positions constitute the framework, combined because they address complementary aspects of one object and make no conflicting claims about the mechanism of learning. **Competency-based education** defines the outcome as demonstrable professional performance rather than knowledge about representations [1, 3]. **Constructivist learning theory**, particularly Ausubel's account of meaningful learning, explains why external structure matters: new material is learned to the extent that it is anchored in existing cognitive structure, and concept mapping was developed to externalise that structure [19, 20]. **Activity-based learning** specifies that capability forms through participation in structured, object-oriented professional activity rather than through exposure followed by application [21, 22]. **Visual learning and dual coding theory** justify the instrument: verbal and non-verbal information are processed in distinct but interconnected systems, and material encoded in both is more accessible [23, 24, 25]. **Cognitive load theory** constrains its design: working memory is severely limited for novel information, so excessive cells, decorative elaboration, and split attention impose demands unrelated to the objective, and support beneficial to novices becomes redundant as expertise grows [15, 26, 27]. **The systems approach** requires that objectives, content, methods, forms, means, and assessment be adjusted as an interdependent whole. **Sociocultural theory** describes the developmental dynamic — independent capability emerging from assisted performance — and the status of the organizer as a psychological instrument through which analytical operations become available [28].

2.3 Methods and corpus

Seven methods were employed. Theoretical analysis established what each position asserts and whether the positions are compatible. Comparative analysis examined teacher preparation in Finland, Singapore, South Korea, and the United States against four constant parameters. Document analysis characterised institutional arrangements; content analysis categorised sources by strand, population, and whether the teacher appeared as an object of study or an implementation condition, through which the asymmetry reported above was identified. Synthesis, generalisation, and pedagogical modelling produced the framework, the principles, and the two models presented below.

The corpus comprised peer-reviewed international literature, meta-analytic syntheses, national methodological works, and foundational theoretical sources, prioritising publications from 2020 onwards while retaining earlier works that constitute the original statement of a position. It is not the product of a systematic review protocol, and no claim of exhaustive coverage is made; the argument depends on the accuracy of its characterisation of each strand rather than on exhaustiveness.

3. Results

3.1 Functions and conditions of the two instruments

A conceptual table arranges objects along one axis and attributes of comparison along the other, so that the comparison space is explicit and complete: every intersection is either filled or visibly empty, and an empty cell is itself informative. Six functions follow. It **organises knowledge** by localising information that prose distributes across paragraphs, which is the documented source of the matrix advantage [29]. It makes **comparison** unavoidable rather than inferred — substantial for young learners, given the metalinguistic demands of the alternative. It foregrounds **classification**, since categories must be defined before instances are sorted. It supports **synthesis** by condensing distributed information into a single visual field [6]. It requires **analytical work**, because determining what the intersection of an object and an attribute actually is differs from copying, provided the table is not pre-completed [30, 31]. And for the teacher it functions as a **planning instrument**: constructing a table before teaching forces specification of what is to be compared and on what dimensions, which frequently exposes imprecision in the lesson objective.

Graphic organizers form a broader class of node-and-link representations — hierarchies, sequences, cause-and-effect chains, Venn diagrams, semantic and concept maps, story maps — each expressing a different relational pattern. They externalise relational thinking and make it revisable [23]; they support the transition from isolated terminology to systemic understanding [20]; where pupils learn to select and construct them, they become study strategies rather than lesson artefacts; jointly constructed, they make individual contributions and disagreements visible; and completed, they record understanding at a point in time. This last property is diagnostically valuable and, in the view advanced here, the least developed in current preparation: the structure a pupil produces reveals misconceptions that a correct answer to a closed question would conceal.

Three conditions qualify all of these functions and are frequently omitted in applied writing. Effects depend on guidance, and self-generation without in-task support can fail to produce benefits the same activity produces when structured [12, 13]. They depend on the correspondence between the organizer's structure and the content's structure; an ill-fitting schema obscures rather than reveals [14]. And they depend on prior knowledge, so that the same organizer may help one group and hinder another [15]. Each condition is a decision point, and each decision point is a locus of professional competence. The largest effects, notably, are reported for learners with the greatest processing difficulties [32] — that is, precisely where the teacher's calibration matters most.

3.2 Structural specification

Skills in using conceptual tables and graphic organizers are defined here as a functional-structural component of the primary school teacher's methodological competence in mother tongue education. *Functional*, because the component is identified by what it enables the teacher to do rather than by a body of knowledge it contains; *structural*, because it possesses internal organisation rather than constituting an undifferentiated skill. It is a component and not a

competence in its own right: it has no meaning apart from the methodological competence within which it operates.

Four blocks constitute it, ordered by the developmental chain *cognitive* → *practical* → *methodical* → *reflective*. The **cognitive–knowledge block** comprises knowledge of the types of representations and their relational logic, of the cognitive principles governing their design, and of the structural properties of mother tongue content; it also carries the motivational orientation on which serious exercise of the remaining blocks depends. The **practical–activity block** comprises the capacity to construct: to analyse a unit of content for its inherent structure and build the corresponding representation for topics in phonetics, lexicology, morphology, and syntax. The **methodical–pedagogical block** comprises the capacity to teach with such representations: to integrate them at the motivational, presentation, consolidation, and reflection phases of the lesson, to calibrate support to pupils' level, and to mediate pupils' own construction rather than distributing completed materials. The **reflective–evaluative block** comprises the capacity to appraise: to judge whether a representation served its objective, to read pupils' work diagnostically, and to revise accordingly.

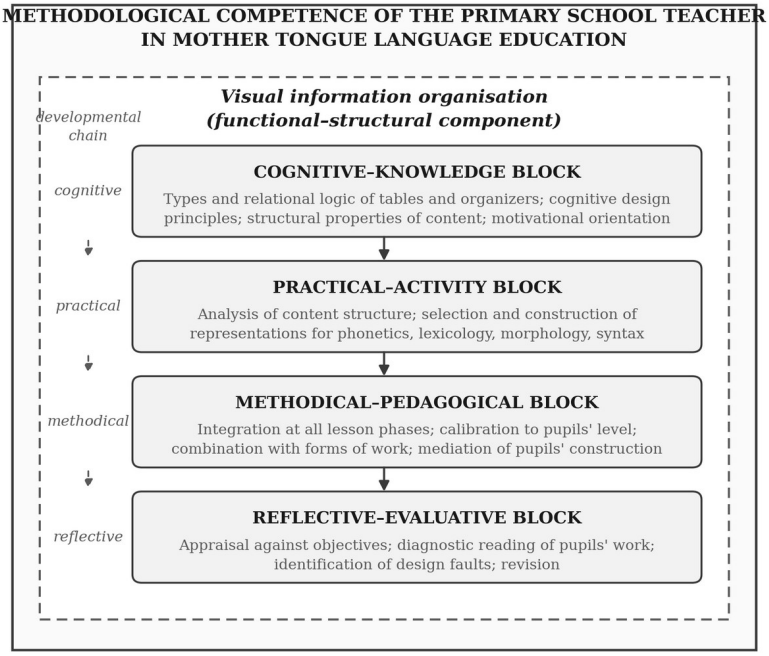


Figure 1. Structural model of visual information organisation as a functional-structural component of methodological competence in mother tongue education.

The four blocks describe *structure*; the five process criteria frequently invoked in accounts of competence formation — cognitive-motivational, informational, practical-activity, creative, reflective — describe *process*, that is, how formation is recognised at a given point. They are not competing taxonomies. Creativity in particular corresponds to no separate block, being a qualitative characteristic of the practical–activity and methodical–pedagogical blocks at their higher levels.

3.3 Principles and process of formation

Six principles govern formation. **Scientific soundness** requires that design rest on established linguistic and cognitive-psychological knowledge; its specific requirement is structural correspondence between representation and content [14]. **Systematicity and sequence** requires

staged progression, with support planned as a sequence from worked example through partially completed organizer to independent construction and withdrawn deliberately [12, 13, 15]. **Activity and independence** requires that candidates learn by constructing and in turn design tasks in which pupils construct rather than receive [30, 33, 31]; the level of cognitive engagement a task demands, not its surface activity, determines the outcome [34]. **Visuality and demonstrativeness** subordinates visual form to cognitive function, so that cell count, label density, and degree of pre-completion are evaluated by their effect on load [26, 27]. **Integrativity** requires that representations connect sections of the course to one another and to other subjects. **Reflection and assessment** requires that every representation be appraised against its objective, using pupils' completed work as evidence where practicum permits.

These principles are realised through five stages. The **preparatory–diagnostic stage** establishes candidates' initial knowledge and readiness through diagnostic tasks and forms the motivational orientation, including analysis of documented cases of unsuccessful use — which develops design criteria more efficiently than successful examples alone. The **design–constructive stage** develops the practical–activity block: candidates construct systems of representations for the sections of the course, selecting among Venn diagrams, clusters, concept and mind maps, T-charts, and multi-column tables according to the structure of the topic, proceeding from worked examples to independent design on both paper and digital media. The **practical–applied stage** develops the methodical–pedagogical block and relocates the activity from artefacts to their instructional use through lesson fragments, microteaching, practicum, and the mediation of pupils' construction; it is the pivot of the process and the point at which preparation most commonly stops short. The **monitoring–analytical stage** develops the reflective–evaluative block through diagnosis, expert appraisal against the six principles, and diagnostic analysis of pupils' work. The **generalisation–refinement stage** consolidates the outcome through revision and a portfolio with methodological commentary, and supplies the evidence on which the methodology itself is refined.

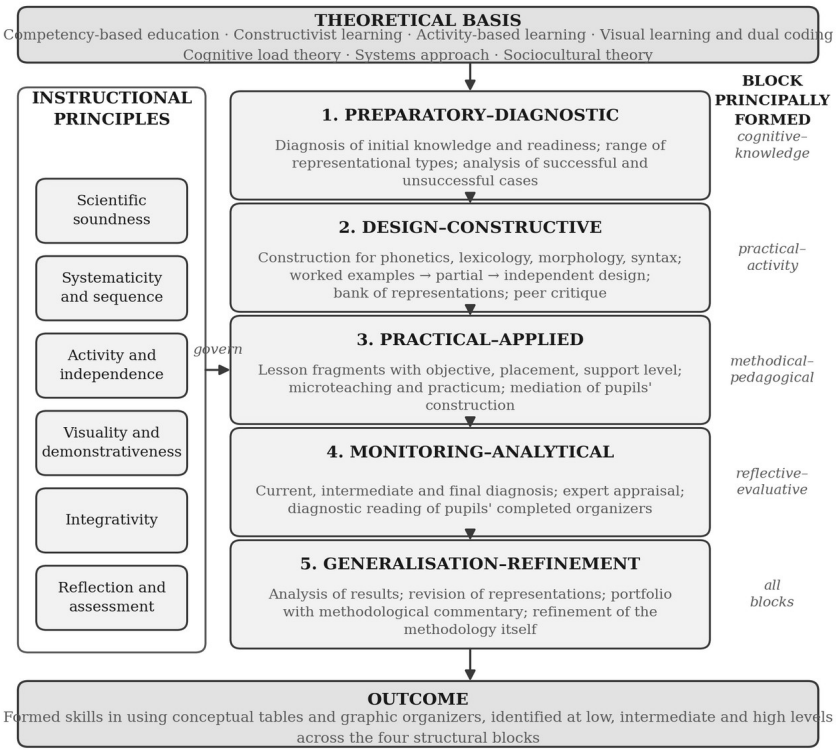


Figure 2. Methodological framework for developing pre-service primary teachers' skills in using conceptual tables and graphic organizers in mother tongue language education.

The stages are realised through analysis of content structure, worked examples with faded support, comparative analysis of alternative representations of the same content, problem-based tasks, case study, and project work, organised in individual, paired, and group forms and supported by national methodological accounts of interactive instruction [35]. Assessment addresses the quality and justification of design decisions rather than the appearance of the artefacts.

3.4 Levels of formation

Formation within each block is identified at three levels, specified in Table 1.

Table 1. Levels of formation of skills in using conceptual tables and graphic organizers, by structural block

Block	Low level	Intermediate level	High level
Cognitive–knowledge	Superficial notion of the instruments; unable to distinguish types; knowledge fragmentary	Knows principal types and concepts; knowledge unsystematised, interdisciplinary connections weakly grasped	Systematically relates instruments to content, interdisciplinary connections, and didactic objectives
Practical–activity	Copies provided models; frequent errors of category logic and structural	Constructs from templates and algorithms; partial independence,	Constructs, adapts, and refines representations independently and

Block	Low level	Intermediate level	High level
	fit	limited creative adaptation	creatively for defined purposes
Methodical–pedagogical	Cannot relate representations to objective and content; use episodic and formal	Uses representations mainly at revision and consolidation; effectiveness partial	Uses representations at all lesson phases; develops pupils' systemic thinking; sustains interactive instruction
Reflective–evaluative	Does not analyse own activity; errors unrecognised	Reflection episodic; requires the teacher educator's assistance	Analyses own activity critically and systematically; directs own development

The transition between levels is not spontaneous. It is secured through targeted preparation, interactive technologies, and the deliberate development of reflective activity, and the analysis indicates that the transition from the intermediate to the high level depends chiefly on the methodical–pedagogical block — the block that receives least attention where preparation stops at the production of artefacts.

3.5 International comparative analysis

Comparison is instructive only if structured. Table 2 compares four systems against four constant parameters, directed at a specific question: what arrangements support the formation of design-level pedagogical judgement?

Table 2. Comparative analysis of teacher preparation arrangements bearing on design-level pedagogical judgement

Parameter	Finland	Singapore	South Korea	United States
Pedagogical reasoning	Research-based master's-level preparation; justification of pedagogical decisions is a defining professional attribute	Coherent institutional preparation with explicit articulation between theory and practice	Selective entry with strong subject and methodological preparation; national examination shapes emphasis	Highly variable; strongest programmes emphasise clinical preparation, but coherence is not system-wide
Role of practicum	Extended supervised practice in university-affiliated	Substantial structured practicum with defined mentoring and	Structured but generally shorter; strong subject-methodology	From limited placement to year-long clinical

Parameter	Finland	Singapore	South Korea	United States
	schools, integrated with coursework	induction	emphasis	residency
Structural representation in language methodology	Embedded in general methodological preparation	Addressed within pedagogy courses; institutional materials capacity	Reflected in a substantial national research literature on graphic organizer intervention	Present in literacy methods courses, supported by an extensive text-structure research base
Transferable element	Requirement that pedagogical decisions be justified from evidence	Articulation between coursework and practicum tasks	Systematic accumulation of a national research base	Explicit treatment of structural representation in literacy methodology

Three observations follow. First, the parameter on which the systems differ most is not the presence of visual organisation in the curriculum but the extent to which pedagogical decisions must be *justified*; in the Finnish arrangement the research-based orientation makes justification habitual rather than merely assessed [3, 36]. This is the element most relevant here, and the least dependent on structural reform: a requirement that every designed representation carry a methodological rationale can be introduced within an existing course. Second, coherence is achieved through articulation between components rather than the strength of any single component, as Singapore's deliberate connection of methodology coursework to practicum illustrates [37]. Third, South Korea's substantial national literature on graphic organizer intervention [7] shows that a domestic evidence base can be accumulated systematically — a direction indicated for Uzbekistan, where research on the instrument remains confined to a small number of recent and largely descriptive studies [18], none addressing mother tongue teacher preparation, and where the national methodological canon establishes the content and its sequence but not its visual organisation [38, 39, 40].

Transferability requires care. Finland's arrangement rests on selectivity and institutional trust that cannot be legislated, and the strongest United States programmes are not representative of that system. What is transferable is not structure but principle: justified design decisions, coursework–practicum articulation, and deliberate accumulation of a domestic evidence base.

4. Discussion

The syntheses reviewed above are frequently read as establishing that conceptual tables and graphic organizers are effective instruments. The present analysis indicates that this reading is incomplete in a way that matters for teacher education. The same syntheses report that effects are moderated by structural fit, guidance, and prior knowledge, and the most recent documents publication bias in classroom research [11, 12, 14, 15]. What the evidence supports is not a *tool-*

provision conclusion — that supplying teachers with organizers will improve learning — but a *design-and-mediation* conclusion. The practical consequence is considerable, since the tool-provision reading underwrites the template banks that constitute much current provision.

It would be possible to respond by proposing visual information organisation as a distinct professional competence, and the proliferation of competence frameworks documented in the digital-competence literature indicates that this response is common [16]. The analysis does not support it. The decisions the instrument requires are not separable from methodological competence in the subject; they are that competence exercised on a particular class of instruments. Specifying the capability as a functional-structural component avoids both the inflation of a technique into a competence and its reduction to a classroom convenience.

The **theoretical contribution** is therefore the demonstration that conditional effectiveness at the learner level entails design competence at the teacher level, an implication systematically overlooked in a literature organised around learner outcomes. The **methodological contribution** is the four-block specification ordered by a developmental chain, six principles, five stages, and levels by block — distinguished by the analytical separation of the methodical–pedagogical block from the practical–activity block, and correspondingly of the practical–applied stage from the design–constructive stage. Existing accounts of graphic organizer use in teacher preparation typically treat construction and instructional use as a single capability and in practice stop at construction. The **practical contribution** is that the five stages map onto an existing methodological course followed by practicum, requiring reallocation of tasks rather than new courses, while the principles and the level indicators in Table 1 supply assessment criteria addressing design quality rather than artefact appearance. Teacher educators model the practices they teach whether or not they intend to; where representations are used in university instruction as displays to be copied, candidates acquire that model regardless of course content.

The **limitations** follow from the design. The study reports no empirical data, and no claim is made that the proposed foundation improves any measured outcome; the models are theoretical constructions, not validated instruments. The corpus was assembled purposively rather than by systematic protocol, and the comparative analysis relies on secondary system-level accounts at a level of generality that obscures within-system variation. Transferability beyond primary mother tongue education in Uzbekistan is plausible but unexamined.

Future research should accordingly address experimental implementation of the five-stage methodology, with outcomes measured on the quality and justification of design decisions rather than artefact production; operationalisation of the level indicators into validated instruments, the reflective–evaluative block presenting the greatest measurement difficulty; the effect of AI-assisted generation of organizers, which shifts the scarce capability from construction to the evaluation and adaptation of generated representations and raises the open question of whether design judgement can form when the constructive activity that develops it is automated; and the distribution of this competence among teacher educators, which is a precondition of implementation.

5. Conclusions

The international evidence establishes that conceptual tables and graphic organizers support learning under conditions determined by structural fit, guidance, and prior knowledge. Because these conditions are produced by professional decisions, the effectiveness demonstrated at the learner level presupposes a design capability at the teacher level — documented extensively in the first case and scarcely in the second.

Competency-based education, constructivist learning theory, activity-based learning, visual learning and dual coding theory, cognitive load theory, the systems approach, and sociocultural theory divide this object between them without contradiction, defining respectively the outcome, the mechanism of its formation, the justification of the instrument, the constraints on its design, the coherence of preparation, and the developmental dynamic. Their integration provides a sufficient basis for the systematic development of the skills in question.

Visual information organisation is properly specified as a functional-structural component of the primary teacher's methodological competence in mother tongue education, comprising cognitive–knowledge, practical–activity, methodical–pedagogical, and reflective–evaluative blocks. Its formation proceeds through preparatory–diagnostic, design–constructive, practical–applied, monitoring–analytical, and generalisation–refinement stages, governed by the principles of scientific soundness, systematicity and sequence, activity and independence, visuality and demonstrativeness, integrativity, and reflection and assessment. The practical–applied stage is the pivot of the process, and the methodical–pedagogical block the point at which current preparation most commonly falls short.

The foundation is a theoretical construction awaiting empirical examination. Its value lies in specifying, with sufficient precision to be tested and if necessary refuted, what has hitherto been left implicit: that the demonstrated power of visual information organisation rests on professional judgement, and that professional judgement must be deliberately formed.

Declarations

Conflict of interest. The author declares no conflict of interest.

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Ethical statement. This study is theoretical and involved no human participants; ethical approval was therefore not required.

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ENHANCING THE MODEL FOR TEACHING MEDICAL TERMINOLOGY IN ENGLISH TO FUTURE PHYSICIANS

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Abstract. *This article studies modern methods which teach medical terminology in English to medical students by evaluating their instructional methods and teaching methods which create better learning outcomes. The research results show that effective teaching methods should use structured word learning together with practical medical experience and hands-on educational activities.*

Keywords: *medical terminology, medical education, pedagogical model, terminological competence, future physicians, teaching methodology*

Аннотация. *Данная статья рассматривает современные подходы к обучению медицинской терминологии на английском языке будущих врачей, анализируя педагогические модели и методологические основы, повышающие эффективность обучения. Результаты исследования показывают, что оптимальные модели обучения сочетают систематическое овладение лексикой с погружением в клинический контекст и интерактивными методологиями обучения.*

Ключевые слова: *медицинская терминология, медицинское образование, педагогическая модель, терминологическая компетенция, будущие врачи, методология преподавания.*

Annotatsiya. *Ushbu maqola bo'lajak shifokorlarga ingliz tilida tibbiy terminologiyani o'qitishning zamonaviy yondashuvlarini ko'rib chiqadi, ta'lim samaradorligini oshiruvchi pedagogik modellar va metodologik asoslarni tahlil qiladi. Tadqiqot natijalari shuni ko'rsatadiki, optimal o'qitish modellari tizimli lug'at o'zlashtirishni klinik kontekstga kiritish va interfaol ta'lim metodologiyalari bilan birlashtiradi.*

Kalit so'zlar: *tibbiy terminologiya, tibbiy ta'lim, pedagogik model, terminologik kompetentsiya, bo'lajak shifokorlar, o'qitish metodologiyasi.*

Introduction. Doctors from different countries use medical terminology as their primary language system to establish exact communication with one another. English serves as the main language for scientific publications which means doctors now require English medical terminology skills as their primary professional requirement because of global medical operations [1]. The teaching of medical terminology requires advanced methods because its Greek and Latin roots combined with its vast naming systems and its ongoing development through scientific discoveries create severe educational difficulties for teachers to handle [2]. Medical terminology teaching methods which depend on students memorizing separate medical terms and their meanings have proven unsuccessful in helping students achieve proper medical communication skills which require them to combine accurate medical terms with their clinical judgment and situational understanding in real-life work settings [3]. Modern medical training programs require their students to learn medical terms through two distinct processes which teach them both actual vocabulary and complete terminological expertise that combines language skills with professional communication abilities and medical reasoning skills [4].

Methodology and Literature Review. The researchers use systematic literature analysis as their main research method to study medical terminology teaching methodologies which exist in

educational research and scholarly articles and pedagogical frameworks. The learning theory of constructivism shows that students create their understanding of medical terms through active involvement in real-life situations but not through basic understanding of single word definitions which teachers should use to develop their teaching methods that need to show students how to use medical terms in real situations and solve actual problems [5]. The theory of cognitive load demonstrates that medical terminology education needs methods which cut down on unnecessary mental workload while enabling essential cognitive development through term grouping and visual aids and structured learning materials [6].

Research on vocabulary acquisition in specialized domains shows that etymology-based instruction helps students better remember words while they learn to recognize unfamiliar words through their morpheme parts. Studies show that teaching Greek and Latin roots together with their prefixes and suffixes through explicit instruction results in better learning outcomes which lead to improved academic performance in professional vocabulary use across time [7]. The literature shows that medical language training should occur together with practical experience because students need to learn medical terms which they will use in real situations that require them to show their understanding through accurate term usage during diagnostic analysis and patient record creation and team-based medical discussions [8]. Technology-enhanced learning approaches have gained prominence because research shows that multimedia resources and interactive digital platforms and spaced repetition systems help students learn terminology through multiple learning methods while keeping their attention [9].

Results and Discussion. Analysis of contemporary research and pedagogical practices yields several critical insights regarding enhancement of teaching models for medical terminology. First, effective models must balance systematic vocabulary acquisition with contextual application, recognizing that students require both comprehensive terminological knowledge bases and skills in deploying terminology appropriately within professional communication contexts. This balance can be achieved through instructional designs that alternate between focused vocabulary building activities and authentic task-based learning where students apply terminology in simulated clinical scenarios, case discussions, and professional writing exercises. Second, etymology-based instruction emerges as a powerful pedagogical strategy that should occupy central position in enhanced teaching models, as understanding word formation principles enables students to analyze unfamiliar terms independently and reduces the cognitive burden of memorizing thousands of seemingly arbitrary medical words.

Systematic instruction in Greek and Latin morphemes, coupled with explicit demonstration of how these elements combine to create medical terminology, provides students with analytical tools that extend beyond any specific vocabulary list. Third, integration of multimedia and technology-enhanced learning resources addresses contemporary students' learning preferences while leveraging proven benefits of multi-modal presentation, with digital flashcard systems, interactive anatomy applications, and video-based clinical vignettes offering varied engagement pathways that accommodate diverse learning styles and support spaced repetition strategies essential for long-term retention. Fourth, enhanced models must explicitly address the communicative dimension of terminology use, recognizing that accurate term knowledge is necessary but insufficient for professional competence, requiring instruction that develops students' abilities to explain complex medical concepts to patients using appropriate terminology, document clinical findings with precision, and participate effectively in interdisciplinary healthcare team communications.

Conclusion. Enhancement of pedagogical models for teaching medical terminology in English to future physicians requires systematic integration of evidence-based instructional strategies that address both the linguistic complexity of medical terminology and the professional communication competencies essential for clinical practice. The analysis presented in this study demonstrates that optimal teaching approaches combine etymology-based vocabulary instruction with contextual clinical applications, leverage technology-enhanced learning resources to support systematic acquisition and retention, explicitly develop professional communication skills alongside terminological knowledge, and employ authentic performance-based assessment to evaluate students' abilities to deploy terminology appropriately in professional contexts. These components should be integrated within coherent curricular frameworks that recognize medical terminology instruction as foundational to broader medical education objectives rather than isolated skills training.

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INTERACTIVE INSTRUCTIONAL STRATEGIES FOR TEACHING THE HISTORY OF PEDAGOGY BASED ON JADID HERITAGE IN A DIGITAL LEARNING ENVIRONMENT

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Abstract. *The rapid digital transformation of higher education has created a growing need for innovative instructional strategies that actively engage students while preserving the educational value of national pedagogical heritage. Although interactive learning has become a widely accepted approach in digital education, limited attention has been given to integrating Jadid pedagogical heritage into the teaching of the History of Pedagogy through technology-enhanced instructional practices. This study aims to develop and analyze interactive instructional strategies that combine Jadid educational ideas with digital learning tools to improve the teaching of the History of Pedagogy module. A mixed-methods research design was employed, incorporating classroom implementation, pedagogical observation, document analysis, and comparative evaluation involving undergraduate teacher education students. The proposed instructional framework integrates collaborative, discussion-based, analytical, and reflective learning activities supported by digital technologies. The findings indicate that these strategies enhance students' engagement, historical-pedagogical thinking, collaborative learning, and digital competence while facilitating a deeper understanding of Jadid educational philosophy. The study contributes a validated interactive methodological framework that integrates Jadid pedagogical heritage, collaborative instructional strategies, QR-supported digital resources, and competency-based assessment into a coherent model for teaching the History of Pedagogy in higher education.*

Keywords: *History of Pedagogy, Jadid heritage, interactive instructional strategies, digital learning environment, teacher education, educational technology*

1. INTRODUCTION

1.1. Relevance

Although digital technologies have significantly transformed higher education, effective learning depends not merely on technological availability but on the pedagogical approaches that organize students' learning experiences. This challenge is particularly evident in the History of Pedagogy module, where historical knowledge is frequently delivered through lecture-based instruction that provides limited opportunities for active participation, critical discussion, and reflective learning. As a consequence, students often demonstrate insufficient engagement, superficial understanding of historical-pedagogical concepts, and limited ability to connect historical educational ideas with contemporary professional practice.

The pedagogical philosophy of the Jadid movement offers valuable principles for overcoming these challenges. Jadid educators advocated learner-centred instruction, independent thinking, discussion-based learning, visual teaching, and practical application of knowledge—

principles that closely correspond to modern interactive pedagogy. However, these methodological ideas have not yet been systematically transformed into an integrated instructional system suitable for digitally supported university education. Developing such a methodological framework therefore represents an important educational priority for improving both instructional quality and students' professional competencies.

1.2. Scientific Background

The rapid digital transformation of education has fundamentally reshaped teaching and learning processes in higher education, requiring pedagogical approaches that extend beyond the simple adoption of digital technologies. Contemporary educational research emphasizes that meaningful digital transformation depends on redesigning instructional processes, promoting learner-centered environments, and encouraging active student participation rather than merely introducing technological tools into classrooms [1–4]. Consequently, interactive instructional strategies have become an essential component of digital pedagogy because they enable students to construct knowledge collaboratively while developing higher-order thinking skills.

Recent studies indicate that effective digital learning environments are characterized by flexibility, collaboration, personalization, and active engagement. Blended and technology-enhanced learning environments provide students with greater control over the pace, time, and place of learning while encouraging interaction, self-regulated learning, and collaborative knowledge construction [3,5]. Similarly, adaptive learning technologies, multimedia resources, and interactive educational platforms contribute to improved learning experiences when they are integrated through pedagogically meaningful instructional designs rather than being treated as independent technological innovations [5–7].

Research also demonstrates that the role of teachers has changed considerably in digitally supported education. Instead of functioning primarily as knowledge transmitters, teachers increasingly act as facilitators, learning designers, and organizers of collaborative learning experiences. This transformation requires educators to possess not only digital competence but also the ability to design interactive activities that stimulate critical thinking, reflection, communication, and problem-solving [6,8–10]. Therefore, educational technology should be regarded as a pedagogical mediator supporting meaningful learning rather than as an end in itself [7,9]. Accordingly, teacher education increasingly requires instructional models that combine digital competence with interactive pedagogical practices capable of supporting meaningful and student-centred learning [6,8–10].

Despite these advances, relatively limited attention has been devoted to teaching historical and pedagogical disciplines through interactive digital strategies. Existing studies primarily investigate digital competence, blended learning, online instruction, or educational technologies in general education settings, whereas the pedagogical potential of historical educational heritage remains underexplored [5,8]. In particular, there is little empirical evidence regarding how national pedagogical traditions can be integrated into interactive digital learning environments to enhance historical understanding and professional competence among future teachers.

The pedagogical heritage of the Jadid movement represents one of the most significant educational reform traditions in Central Asia, emphasizing critical thinking, learner activity, national identity, and educational modernization. Although these educational principles demonstrate strong conceptual compatibility with contemporary interactive learning approaches, few studies have examined systematic strategies for integrating Jadid pedagogical ideas into digitally supported instruction for the **History of Pedagogy** module. This gap indicates the need

for an instructional framework that combines interactive learning strategies with digital technologies while preserving the educational value of national pedagogical heritage. Recent studies have consistently demonstrated that meaningful learning in higher education depends not only on the integration of digital technologies but also on the implementation of interactive instructional strategies that actively involve students in the learning process. Experience-Based Learning (EBL), Problem-Based Learning (PBL), gamification, simulations, and collaborative learning approaches have been recognized as effective pedagogical innovations because they encourage active participation, critical reflection, and knowledge construction rather than passive information acquisition [11–20]. These approaches shift the focus of instruction from teacher-centred knowledge transmission toward learner-centred educational experiences, where students develop analytical, communicative, and problem-solving competencies through meaningful engagement.

Experience-Based Learning is considered one of the most influential pedagogical approaches supporting interactive learning in higher education. Unlike traditional lecture-based instruction, EBL emphasizes authentic experiences, reflection, collaborative activities, and reconstruction of knowledge through participation in educational tasks [11,12]. Similarly, Problem-Based Learning encourages students to investigate authentic educational problems, discuss alternative solutions, and collaboratively construct knowledge while instructors function as facilitators of learning rather than information providers [13]. Such approaches correspond closely with the principles of contemporary digital pedagogy, where interaction and learner autonomy are regarded as central components of effective instructional design.

The integration of digital technologies has further expanded opportunities for implementing interactive instructional strategies. Educational web platforms, learning management systems, virtual learning environments, multimedia resources, and collaborative online activities provide flexible environments in which students can actively participate in learning regardless of time and location [14,15]. However, previous studies emphasize that technology itself does not improve learning outcomes unless it is accompanied by carefully designed instructional strategies aligned with specific learning objectives and cognitive processes [16].

Another important direction within educational innovation concerns the application of game elements and motivational mechanisms to strengthen learner engagement. Gamification introduces challenges, feedback, collaboration, rewards, and interactive participation into educational settings, thereby increasing students' motivation, persistence, and involvement in classroom activities [17]. Rather than transforming education into entertainment, gamification utilizes motivational principles derived from game design to support meaningful learning, sustained engagement, and deeper cognitive processing [18]. Research has shown that interactive educational environments enriched with collaborative activities and motivational strategies contribute to greater knowledge retention and improved academic performance compared with conventional lecture-based instruction [19].

Bloom's revised taxonomy also provides an important theoretical foundation for designing interactive instructional strategies. Learning activities should gradually develop students' cognitive abilities from remembering and understanding toward analysing, evaluating, and creating knowledge [20]. Consequently, instructional strategies should be selected according to intended learning outcomes rather than technological availability. This pedagogical perspective is particularly relevant for teaching historical and pedagogical disciplines, where critical

interpretation, analytical reasoning, and reflective thinking constitute essential educational objectives.

1.3. Research Gap

Previous studies have extensively examined digital transformation in education, interactive learning environments, gamification, and the historical significance of Jadid pedagogy. Other investigations have explored separate aspects of digital instructional technologies or the educational philosophy of individual Jadid scholars. Nevertheless, several important gaps remain.

First, limited attention has been devoted to designing a comprehensive methodological system that integrates Jadid pedagogical heritage with contemporary interactive teaching strategies specifically for the *History of Pedagogy* module. Second, existing studies rarely explain how instructional objectives, learning content, teaching methods, digital resources, classroom organization, and assessment can function as interconnected components within a single methodological framework. Third, empirical evidence evaluating the educational effectiveness of such an integrated system through controlled pedagogical experimentation remains scarce. Finally, interactive instructional resources based on Jadid heritage—including QR-supported materials, collaborative activities, and digital methodological tools—have received little systematic development in higher education.

1.4. Aim

The aim of this study is to develop and experimentally validate an interactive methodological system for teaching the *History of Pedagogy* module through the integration of Jadid pedagogical heritage and contemporary interactive instructional strategies within a digitally supported higher education environment.

1.5. Objectives

To achieve this aim, the study pursues the following objectives:

1. To establish the theoretical and pedagogical foundations for integrating Jadid educational heritage into an interactive methodological system for teaching the *History of Pedagogy* module.
2. To design a methodological framework that integrates instructional objectives, learning content, interactive teaching methods, digital learning resources, organizational forms, and assessment procedures into a unified instructional system.
3. To develop interactive instructional materials, including QR-supported educational resources and collaborative classroom activities, aligned with the proposed methodological framework.
4. To experimentally evaluate the effectiveness of the proposed methodological system in improving students' academic achievement, historical-pedagogical thinking, classroom engagement, and digital competence.

1.6. Novelty

The novelty of this study lies in proposing and experimentally validating a comprehensive interactive methodological system that integrates Jadid pedagogical heritage with contemporary learner-centred instructional strategies for teaching the *History of Pedagogy* module. Unlike previous studies that primarily emphasize digital technologies or historical content separately, the proposed framework combines pedagogical objectives, instructional content, interactive teaching methods, digital educational resources, collaborative learning activities, QR-supported instructional materials, and competency-based assessment into a coherent instructional model. This integrated methodological approach provides a practical mechanism for transforming

historical-pedagogical instruction from knowledge transmission into active, student-centred learning.

1.7. Significance

This study contributes theoretically by extending the conceptual understanding of how historical pedagogical heritage can be systematically integrated with contemporary interactive teaching methodologies in higher education. Methodologically, it offers an evidence-based instructional framework that demonstrates the functional relationships among interactive teaching strategies, digital learning resources, and competency-oriented assessment. Practically, the proposed methodological system provides university instructors with adaptable instructional models, QR-supported learning materials, collaborative learning activities, and interactive teaching techniques that enhance student participation, historical-pedagogical thinking, and professional competence. The findings may also support curriculum modernization in teacher education programmes seeking to combine national educational heritage with internationally recognized principles of active learning.

2. METHODS

Unlike conventional lecture-oriented instruction, the proposed methodological system was structured around active student participation and collaborative knowledge construction. The instructional design emphasized the pedagogical principles of learner-centred education, experiential learning, reflective practice, and collaborative inquiry. Particular attention was given to adapting the educational ideas of the Jadid movement to contemporary digital learning environments while preserving their historical and cultural significance.

The effectiveness of the proposed methodological system was evaluated through a pedagogical experiment conducted with experimental and control groups. Students in the experimental group studied the *History of Pedagogy* module using the developed interactive instructional framework, whereas students in the control group received conventional lecture-based instruction following the existing curriculum. The instructional intervention incorporated collaborative discussion, reflective learning, analytical activities, digital educational resources, and QR-supported learning materials designed specifically for the module.

To ensure the systematic implementation of the intervention, the methodological system was organized as an integrated instructional process in which all components functioned as interconnected elements rather than independent teaching techniques. Learning objectives determined the selection of instructional content; instructional content guided the choice of interactive learning strategies; digital resources supported classroom implementation; and competency-based assessment continuously monitored students' learning progress throughout the instructional process. This systemic organization enabled the evaluation of both the effectiveness of individual interactive strategies and the overall instructional framework.

Both qualitative and quantitative data were collected throughout the pedagogical experiment. Classroom observations, instructional monitoring, analysis of students' learning products, and reflective feedback provided qualitative evidence regarding students' participation, collaboration, and engagement. Quantitative data were obtained through diagnostic assessments, competency-based evaluation criteria, questionnaires, and academic achievement measures administered before and after the instructional intervention. The integration of these data sources strengthened the validity of the research findings by providing complementary evidence concerning the educational effectiveness of the proposed interactive methodological system.

The overall research methodology was therefore designed not only to examine the effectiveness of individual interactive instructional strategies but also to evaluate their pedagogical integration within a comprehensive methodological framework for teaching the *History of Pedagogy* based on Jadid heritage in a digital learning environment.

This study employed a mixed-methods research design to develop, implement, and evaluate an interactive methodological framework for teaching the *History of Pedagogy* module based on Jadid pedagogical heritage in a digitally supported learning environment. The research integrated qualitative and quantitative approaches to examine both the instructional process and educational outcomes. The methodology consisted of the following components: research design, participants and research setting, interactive methodological framework, instructional strategies, digital learning resources, data collection instruments, data analysis procedures, and ethical considerations. Each component is presented in the following subsections.

2.1. Research Design

This study adopted a mixed-methods research design to develop, implement, and evaluate an interactive methodological system for teaching the *History of Pedagogy* module based on Jadid pedagogical heritage in a digitally supported learning environment. The research combined qualitative and quantitative approaches to obtain a comprehensive understanding of both the instructional process and learning outcomes. Qualitative methods were employed to examine the pedagogical implementation of the proposed instructional strategies, whereas quantitative methods were used to measure their effectiveness in improving students' academic achievement, historical-pedagogical thinking, digital competence, and classroom engagement.

The research was conducted in four consecutive stages. The first stage focused on reviewing historical, pedagogical, methodological, and digital education literature to establish the theoretical foundation of the interactive methodological system. During the second stage, the instructional framework was designed by integrating Jadid pedagogical principles with interactive teaching strategies and digital learning resources. The third stage involved classroom implementation of the proposed methodological system in experimental groups, while the final stage consisted of evaluating instructional effectiveness through pedagogical experimentation and statistical analysis. This phased design ensured consistency between theoretical development, instructional implementation, and educational evaluation.

2.2. Participants and Research Setting

The pedagogical experiment was conducted during the 2024–2026 academic years in three higher education institutions in Uzbekistan that offer undergraduate teacher education programmes. The participants comprised **840 undergraduate students** enrolled in the *History of Pedagogy* module. Students were assigned to an experimental group (**n = 422**) and a control group (**n = 418**). The experimental group received instruction using the proposed interactive methodological system, whereas the control group studied the same module through conventional lecture-based instruction following the existing curriculum.

The participating institutions included Gulistan State Pedagogical Institute, Jizzakh State Pedagogical University, and the National University of Uzbekistan. These universities were selected because they provide comparable teacher education programmes and follow similar curricular requirements for pedagogical disciplines. Prior to the instructional intervention, diagnostic assessments confirmed that no statistically significant differences existed between the experimental and control groups regarding academic preparedness and prior knowledge of the subject. This comparability ensured the reliability of subsequent experimental findings.

2.3. Interactive Methodological Framework

The methodological framework developed in this study was designed as an integrated instructional system in which instructional objectives, learning content, interactive teaching strategies, digital learning resources, organizational forms, and competency-based assessment functioned as mutually dependent pedagogical components rather than independent instructional elements. The framework was grounded in learner-centred education, constructivist learning theory, experiential learning, and the educational philosophy of the Jadid movement, emphasizing active participation, collaborative knowledge construction, reflective thinking, and independent inquiry.

Unlike traditional content-oriented instruction, the proposed framework organized classroom activities around interactive learning experiences that encouraged students to analyse historical events, interpret pedagogical ideas, discuss educational problems collaboratively, and relate Jadid educational philosophy to contemporary teacher education. Digital technologies served as pedagogical support tools that expanded opportunities for interaction, visualization, collaboration, and independent learning rather than replacing instructional practice.

Table 1.

Components of the Interactive Methodological Framework

Component	Description	Expected Learning Outcome
Learning objectives	Development of historical-pedagogical thinking, digital competence, and professional awareness	Competency-oriented learning
Learning content	Jadid pedagogical heritage integrated with the History of Pedagogy curriculum	Meaningful historical understanding
Interactive instructional strategies	Discussion-based, collaborative, analytical, and reflective learning activities	Active participation and critical thinking
Digital learning resources	QR-supported materials, LMS, multimedia presentations, digital archives, online learning platforms	Enhanced accessibility and engagement
Organizational forms	Individual, pair, group, and project-based learning	Collaborative knowledge construction
Assessment	Competency-based assessment using cognitive, analytical, practical, digital, and reflective indicators	Continuous monitoring of learning outcomes

2.4. Interactive Instructional Strategies

The instructional intervention was implemented through a structured set of interactive teaching strategies specifically selected according to the educational objectives of each instructional unit. Rather than applying isolated classroom activities, the strategies were organized into complementary pedagogical categories that supported collaborative learning, analytical reasoning, reflective practice, ethical decision-making, and historical inquiry. Each strategy was

aligned with particular competencies expected from future teachers and was supported by appropriate digital learning resources.

The instructional process integrated eight principal interactive strategies developed and adapted within the proposed methodological system. Collaborative discussion strategies such as **Fishbowl** and **Classroom Journey** encouraged students to analyse historical events collectively, exchange perspectives, and construct shared interpretations of Jadid educational ideas. Analytical strategies including **Diamond Ranking** and **Puzzle** promoted systematic comparison, classification, and evaluation of historical-pedagogical concepts. Reflective approaches such as **Q-Statements** and **3B4Me** supported self-assessment, reflective thinking, and personal interpretation of pedagogical values. Ethical discussion strategies including **Walking Debate** and **Conscience Corridor** facilitated argumentation, decision-making, and critical reflection on educational issues from both historical and contemporary perspectives.

Table 2.

Interactive Instructional Strategies Implemented in the Study

Interactive strategy	Primary pedagogical purpose	Digital support
Fishbowl	Collaborative discussion and knowledge exchange	LMS discussion forum, multimedia
Puzzle	Integration of fragmented historical knowledge	QR-supported resources
Walking Debate	Critical argumentation and decision-making	Interactive presentation
Q-Statements	Reflection and value clarification	Online questionnaire
3B4Me	Individual reflection and self-assessment	Digital worksheet
Classroom Journey	Historical exploration and collaborative inquiry	Interactive timeline
Conscience Corridor	Ethical reasoning and pedagogical reflection	Digital case scenarios
Diamond Ranking	Prioritization and analytical thinking	Interactive ranking cards

2.5. Digital Learning Resources

Digital technologies were integrated into the proposed methodological framework as pedagogical tools that enhanced interaction, accessibility, visualization, and independent learning rather than serving merely as technological supplements. The selection of digital resources was guided by the instructional objectives of the *History of Pedagogy* module and aligned with the pedagogical philosophy of the Jadid movement, which emphasizes learner autonomy, intellectual inquiry, and continuous educational development. Accordingly, digital resources were designed to facilitate students' engagement with historical-pedagogical content while promoting active participation in collaborative learning activities.

A variety of digital learning resources were incorporated throughout the instructional intervention. QR code-supported materials enabled students to access historical documents, multimedia content, supplementary readings, and independent learning activities using mobile devices. The Learning Management System (LMS) served as the primary platform for distributing instructional materials, managing assignments, facilitating online discussions, and providing continuous feedback. Multimedia presentations, digital timelines, interactive historical maps,

educational videos, and electronic archives enriched classroom instruction by illustrating the historical development of pedagogical thought and supporting visual learning. These resources encouraged students to investigate historical events independently while strengthening their digital literacy and research skills.

Digital technologies also supported formative assessment throughout the instructional process. Online quizzes, electronic worksheets, collaborative digital documents, reflective journals, and discussion forums allowed instructors to monitor students' learning progress continuously and provide timely feedback. By integrating digital resources with interactive instructional strategies, the methodological system created a flexible learning environment that promoted collaboration, self-directed learning, and meaningful engagement with the historical and pedagogical content.

Table 3.

Digital Learning Resources Supporting Interactive Instruction

Digital resource	Instructional function	Learning outcome
QR code-supported materials	Immediate access to historical sources and supplementary learning materials	Independent learning and resource navigation
Learning Management System (LMS)	Course management, communication, assignment submission, and feedback	Continuous learning support
Multimedia presentations	Visualization of pedagogical concepts and historical events	Improved conceptual understanding
Interactive historical timelines	Chronological analysis of pedagogical development	Historical thinking
Digital archives	Access to original Jadid educational publications and historical documents	Source analysis skills
Educational videos	Contextual explanation of pedagogical ideas	Enhanced learning motivation
Online collaborative documents	Group projects and collaborative writing	Teamwork and communication skills
Online assessment tools	Formative assessment and immediate feedback	Continuous competency monitoring

2.6. Data Collection Instruments

Data were collected using multiple complementary instruments to ensure a comprehensive evaluation of both the instructional process and students' learning outcomes. The use of multiple data sources enabled methodological triangulation and increased the credibility and validity of the research findings.

Qualitative data were obtained through systematic classroom observations, instructional monitoring, document analysis, and students' reflective learning products. Classroom observations focused on students' participation in interactive activities, collaborative problem-solving, communication patterns, and engagement with digital learning resources. Instructional monitoring documented the implementation of the methodological framework throughout the experimental period, while students' written assignments, reflective journals, and project work provided additional evidence of historical-pedagogical thinking and independent learning.

Quantitative data were collected using diagnostic assessments, competency-based evaluation criteria, structured questionnaires, and academic achievement tests administered before and after the instructional intervention. The assessment framework was developed to evaluate students' progress across five interrelated dimensions: **content mastery, analytical thinking, digital competence, practical application, and reflective evaluation**. These indicators provided a multidimensional perspective on learning outcomes and enabled objective comparisons between the experimental and control groups.

Table 4.

Assessment Criteria Used in the Study

Assessment criterion	**Description**	**Indicator**
Content mastery	Understanding of historical and pedagogical concepts	Accuracy of conceptual knowledge
Analytical thinking	Interpretation and comparison of pedagogical ideas	Critical analysis
Digital competence	Effective use of digital learning resources	Information literacy
Practical application	Application of pedagogical concepts to educational situations	Problem-solving ability
Reflective evaluation	Self-assessment and critical reflection	Reflective thinking

2.7. Data Analysis

The collected data were analysed using both descriptive and inferential statistical techniques in accordance with the mixed-methods research design. Qualitative data obtained from classroom observations, instructional monitoring, students' reflective journals, and learning products were analysed through thematic analysis to identify recurring patterns related to learner engagement, collaborative interaction, historical-pedagogical thinking, and the implementation of the interactive methodological framework.

Quantitative data were analysed using descriptive statistics, including frequencies, percentages, arithmetic means, and standard deviations, to summarize students' learning outcomes. Inferential statistical analysis was conducted using Student's *t*-test to compare the pre-intervention and post-intervention performance of the experimental and control groups. Statistical significance was determined at the conventional confidence level ($p < 0.05$). This combination of descriptive and inferential procedures enabled a comprehensive evaluation of the effectiveness of the proposed methodological system while ensuring the reliability of the experimental findings.

2.8. Ethical Considerations

The study was conducted in accordance with generally accepted ethical principles for educational research. Participation in the pedagogical experiment was voluntary, and all students were informed about the objectives, procedures, and educational purpose of the study before data collection commenced. Participants were assured that the collected information would be used exclusively for scientific research and reported in aggregated form to ensure anonymity and confidentiality.

The instructional intervention did not interfere with the official curriculum or disadvantage any participant. Both the experimental and control groups completed the same academic programme and were assessed according to identical educational standards. Personal information was anonymized during data processing, and the research procedures complied with institutional ethical requirements for educational research involving undergraduate students.

3. RESULTS

3.1. Implementation of the Interactive Instructional Framework

The proposed instructional framework was implemented throughout the *History of Pedagogy* module in the participating universities during the 2024–2026 academic years. Unlike the conventional lecture-based approach, the instructional process was organized around sequential interactive learning activities that actively engaged students in analysing historical-pedagogical ideas, interpreting Jadid educational philosophy, and collaboratively solving instructional problems. The implementation emphasized student participation, reflective inquiry, and digital interaction rather than passive knowledge transmission.

Interactive instructional strategies were introduced progressively across different stages of the learning process. Orientation sessions familiarized students with the objectives of the module and digital learning resources. During the exploration stage, QR-supported materials, historical documents, and multimedia resources encouraged independent investigation of Jadid educational thought. Collaborative learning activities—including Fishbowl discussions, Classroom Journey, Puzzle tasks, Walking Debate, Q-Statements, and Conscience Corridor—were subsequently employed to strengthen analytical reasoning, communication, and historical interpretation. The instructional sequence concluded with reflective activities that encouraged students to evaluate their own learning experiences and professional development.

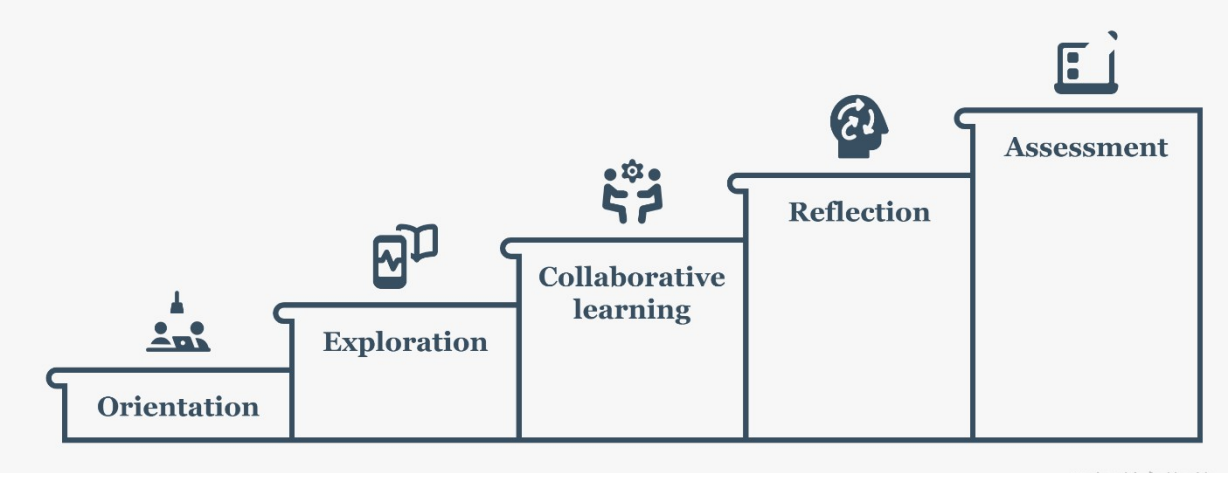


Figure 2.
Distribution of Interactive Instructional Strategies Across the Teaching Process

The staged implementation enabled students to progress from knowledge acquisition to analytical interpretation and reflective evaluation. Classroom observations documented increasing participation in collaborative activities, greater use of digital learning resources, and more frequent student interaction throughout the instructional process.

3.2. Student Engagement and Interactive Learning

One of the most noticeable outcomes of the instructional intervention was the increased level of student engagement throughout the learning process. Students became progressively more involved in classroom discussions, collaborative inquiry, digital learning activities, and reflective evaluation as the intervention advanced. Interactive instructional strategies encouraged learners to assume greater responsibility for their own learning while simultaneously strengthening communication and teamwork skills.

Qualitative classroom observations demonstrated that collaborative strategies such as Fishbowl discussions and Classroom Journey stimulated active participation and enabled students to exchange diverse interpretations of historical-pedagogical concepts. Likewise, reflective strategies including 3B4Me and Q-Statements encouraged students to analyse their own learning progress and identify areas requiring further improvement. QR-supported learning resources further increased students' motivation by providing immediate access to supplementary historical materials beyond the classroom.

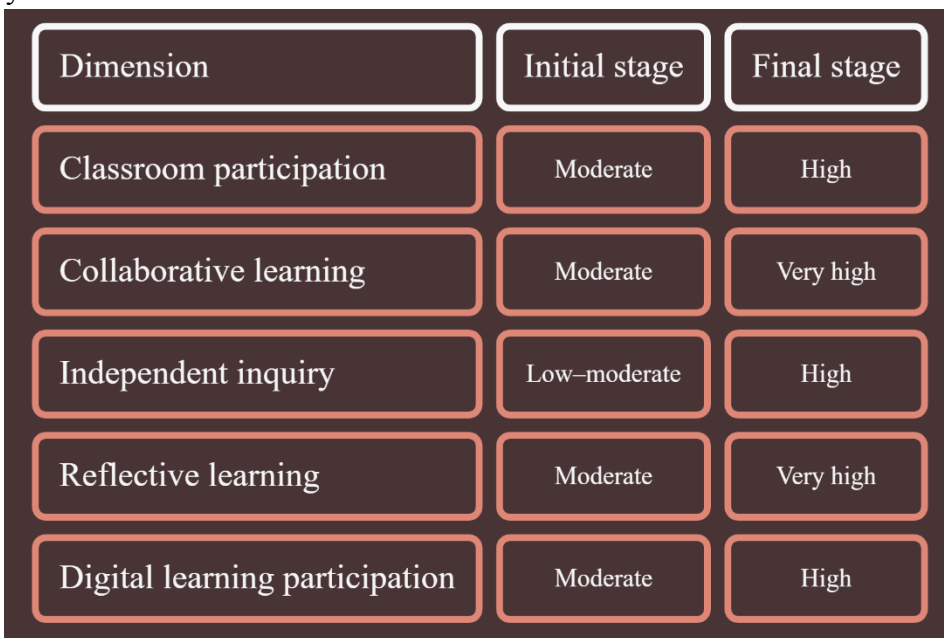


Figure 3.

Changes in Student Engagement During the Instructional Process

Classroom observations documented increased student participation, more frequent collaborative interaction, and greater learner autonomy during the instructional intervention. These patterns were consistently observed across the participating experimental groups.

3.3. Development of Professional Competencies

The competency-based assessment demonstrated improvement across all five evaluation criteria established for the study: content mastery, analytical thinking, digital literacy, practical application, and reflective evaluation. Positive changes were recorded for each competency throughout the instructional intervention.

Among the assessed competencies, analytical thinking and reflective evaluation demonstrated the most substantial development. Students became increasingly capable of interpreting historical educational ideas, comparing different pedagogical perspectives, and relating Jadid educational philosophy to contemporary educational practice. Similarly, digital literacy improved through regular interaction with QR-supported learning materials, multimedia resources, and online learning platforms. Practical application scores also increased, as evidenced

by students' performance in collaborative learning tasks and pedagogical case analyses conducted during the intervention.

Table 5.

Competency Development Observed During the Intervention

Competency	Observed development
Content mastery	Improved understanding of historical-pedagogical concepts
Analytical thinking	Stronger interpretation and critical analysis
Digital literacy	More effective use of digital educational resources
Practical application	Better application of pedagogical knowledge
Reflective evaluation	Greater self-assessment and reflective thinking

The competency profile indicates that the instructional framework contributed to comprehensive professional development rather than solely improving examination performance.

3.4. Overall Learning Outcomes

Although both the experimental and control groups demonstrated academic progress during the study period, the improvement observed in the experimental group was consistently greater. Students who participated in the interactive methodological framework achieved a higher overall level of academic performance than those receiving conventional instruction. According to the final assessment, the experimental group attained a mean achievement score of **3.5**, whereas the control group achieved a mean score of **3.2**, indicating a clear educational advantage associated with the proposed instructional approach.

Figure 4.

Comparison of Overall Mean Achievement Scores

Group	Mean achievement score
Experimental	**3.5**
Control	**3.2**

Rather than representing isolated gains in factual knowledge, these results reflect the cumulative influence of collaborative learning, reflective practice, digital resource integration, and competency-oriented instruction implemented throughout the intervention.

4. DISCUSSION

4.1. Interpretation of the Findings

The findings of this study indicate that the effectiveness of teaching the *History of Pedagogy* module was influenced primarily by the pedagogical organization of learning rather than by the availability of digital technologies alone. The proposed methodological framework combined interactive instructional strategies with digitally supported learning resources, enabling students to engage actively with historical-pedagogical content through collaborative inquiry, discussion, reflection, and problem-solving. Consequently, the experimental group demonstrated higher academic achievement and stronger competency development than students who experienced conventional instruction.

These findings suggest that digital technologies should be regarded as pedagogical facilitators instead of independent determinants of educational quality. Their effectiveness depends largely on how they are integrated into instructional practice. This interpretation supports the view that meaningful learning occurs when technological resources are embedded within carefully designed student-centred learning environments that encourage active knowledge construction rather than passive information transmission [21–24].

Another important observation concerns the role of interaction in learning historical-pedagogical concepts. Traditionally, the *History of Pedagogy* has been taught through lecture-oriented approaches emphasizing factual knowledge and chronological information. In contrast, the present framework encouraged students to analyse historical documents, compare educational philosophies, evaluate reform movements, and construct their own interpretations collaboratively. Such activities transformed historical learning into an active intellectual process that promoted deeper conceptual understanding rather than memorisation alone [25,26].

4.2. Comparison with Previous International Studies

The results of this research correspond with numerous international studies demonstrating that active learning environments improve academic performance and student engagement more effectively than teacher-centred instructional models. Previous investigations have consistently reported that collaborative discussion, inquiry-based learning, and reflective instructional activities promote higher-order thinking, critical analysis, and long-term knowledge retention [26–30].

However, the present study differs from much of the existing literature in an important respect. Most previous investigations have examined interactive learning within science, engineering, medical education, or technology-related disciplines, whereas relatively limited attention has been devoted to historical and pedagogical education. By applying interactive instructional strategies within the *History of Pedagogy* module, this research demonstrates that active learning approaches are equally appropriate for humanities-oriented teacher education.

The integration of Jadid pedagogical heritage also distinguishes this study from previous research. Existing international literature has extensively discussed digital transformation and active learning; however, comparatively few studies have explored how national educational heritage can be incorporated into contemporary digital learning environments. Rather than treating historical content as static knowledge, the proposed framework positioned Jadid educational philosophy as a source of critical discussion, collaborative inquiry, and reflective analysis. This pedagogical integration broadens current understanding of culturally responsive digital education by illustrating how historical traditions may enhance rather than limit educational innovation [31–34].

Furthermore, the competency-based assessment model adopted in this study extends previous findings concerning teacher education. Instead of measuring only academic achievement, the research evaluated students' historical-pedagogical thinking, digital literacy, practical application, analytical reasoning, and reflective evaluation. Such multidimensional assessment corresponds with contemporary international recommendations advocating competency-oriented educational evaluation and professional teacher preparation [33–36].

4.3. Theoretical and Practical Implications

From a theoretical perspective, this study contributes to the growing body of knowledge concerning digitally supported pedagogy by demonstrating that instructional effectiveness emerges through the interaction of pedagogical methodology, digital technology, and culturally meaningful educational content. Rather than considering these elements independently, the proposed methodological framework integrates them into a unified instructional model specifically designed for teacher education.

The research also contributes to the literature on historical-pedagogical education. Existing scholarship frequently addresses digital transformation from technological perspectives, whereas comparatively little attention has been devoted to methodological innovation in teaching the

history of education. By combining Jadid pedagogical heritage with collaborative instructional strategies and digital learning resources, the study provides an alternative model for modernising historical-pedagogical instruction while preserving its cultural and historical authenticity.

From a practical perspective, the findings provide useful guidance for university instructors responsible for teacher education programmes. The instructional strategies developed in this study —including Fishbowl discussions, Classroom Journey, Walking Debate, QR-supported learning activities, reflective assignments, and collaborative inquiry—may be adapted to similar history, education, and humanities courses where student participation and critical thinking represent essential learning objectives.

The findings also suggest that educational digitalisation should not be interpreted simply as technological modernisation. Instead, universities should prioritise instructional design, teacher professional development, and competency-oriented assessment when implementing digital educational reforms. Such an approach is more likely to produce sustainable improvements in teaching quality than technology-centred initiatives alone [37–40].

4.4. Limitations and Future Research Directions

Several limitations should be acknowledged. First, the study was conducted within three higher education institutions in Uzbekistan. Although the consistency of the findings across participating universities strengthens their credibility, caution should be exercised when generalising the results to other national educational systems or cultural contexts.

Second, the investigation focused exclusively on undergraduate students enrolled in the *History of Pedagogy* module. Future research may examine whether the proposed methodological framework demonstrates similar effectiveness within other humanities disciplines, postgraduate teacher education programmes, or continuing professional development courses.

Third, the present research primarily evaluated immediate instructional outcomes. Longitudinal investigations are needed to determine whether improvements in historical-pedagogical thinking, digital competence, and reflective learning remain stable after graduation and contribute to future professional teaching practice.

Finally, future studies may explore the integration of emerging educational technologies—including adaptive learning environments, learning analytics, virtual reality, and artificial intelligence-supported instructional systems—while maintaining the historical authenticity and cultural significance of Jadid pedagogical heritage. Such investigations would further strengthen understanding of how national educational traditions can be meaningfully integrated into contemporary digital higher education.

Overall, the findings demonstrate that effective digital transformation in teacher education depends less on technological sophistication than on pedagogically sound instructional design. The proposed methodological framework illustrates how interactive learning strategies, competency-based assessment, and national pedagogical heritage can be integrated into a coherent educational model that supports both academic achievement and professional competency development. Consequently, this research offers a practical and theoretically grounded contribution to the modernization of historical-pedagogical education within digitally supported learning environments.

5. CONCLUSION

This study developed and evaluated an interactive methodological framework for teaching the History of Pedagogy module through the integration of Jadid pedagogical heritage within a digitally supported learning environment. The framework combined collaborative instructional

strategies, digital learning resources, competency-based assessment, and culturally relevant educational content to promote active learning and professional competency development among undergraduate teacher education students.

The findings demonstrate that the proposed framework contributed to higher levels of academic achievement, stronger historical-pedagogical thinking, improved digital competence, and greater student engagement compared with conventional instructional approaches. These outcomes indicate that the effectiveness of educational digitalisation depends not only on the availability of technological resources but also on the pedagogical quality of instructional design and the meaningful integration of interactive learning strategies into the teaching process.

A major contribution of this research lies in demonstrating that national pedagogical heritage can be effectively integrated into contemporary digital education without diminishing its historical and cultural value. By transforming Jadid educational philosophy into an interactive learning resource rather than presenting it solely as historical information, the study offers a practical model for modernising humanities-oriented teacher education while preserving cultural identity and historical continuity.

The proposed methodological framework also provides practical implications for higher education institutions seeking to improve teacher preparation programmes. Interactive instructional strategies such as collaborative discussion, reflective learning, QR-supported activities, and inquiry-based learning may be adapted to other pedagogy, history, and humanities courses to enhance students' analytical thinking, professional competence, and active participation in the learning process.

Despite these contributions, the study has several limitations. The research was conducted within three higher education institutions in Uzbekistan and focused exclusively on one academic module. Consequently, further studies are needed to examine the applicability of the proposed framework in different educational systems, academic disciplines, and cultural contexts. Future research may also investigate the long-term impact of the framework on professional teaching practice and explore the integration of emerging educational technologies, including artificial intelligence-supported learning environments, learning analytics, and adaptive digital systems, while maintaining the authenticity of national pedagogical heritage.

Overall, this research contributes to the growing body of scholarship on digital pedagogy by demonstrating that sustainable educational innovation is achieved through the balanced integration of pedagogical methodology, digital technology, and culturally meaningful educational content. The proposed framework therefore offers a theoretically grounded and practically applicable approach to improving the teaching of the History of Pedagogy module in contemporary higher education. Future studies may evaluate the applicability of the proposed framework across different educational disciplines and cultural contexts using longitudinal and multi-institutional research designs.

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IMPROVING PSYCHOLOGICAL REHABILITATION FOR WOMEN RETURNING FROM PENAL INSTITUTIONS BY ACTIVATING PERSONAL RESOURCES

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Abstract. *This article addresses issues regarding the enhancement of the socio-psychological rehabilitation of women released from penal institutions. The study aims to develop and evaluate the effectiveness of a psychological rehabilitation program designed to activate women's internal personal resources—such as coping strategies, resilience, and self-awareness—during the process of resocialization. The article examines the legal and social aspects of the Republic of Uzbekistan's penal legislation, relevant presidential decrees and resolutions, and the targeted assistance provided through the "Women's Register" system. Furthermore, it explores mechanisms for cooperation between state and public organizations to prevent recidivism among women, as well as international best practices in this field.*

Keywords: *women, penal institution, research, psychological service, rehabilitation, social role, emotional state, society, psyche, program.*

INTRODUCTION. In the era of globalization and social transformation, the social reintegration (resocialization) of women who have served sentences for criminal offenses remains one of the most pressing issues in modern psychological anthropology and penitentiary psychology. Female criminality differs fundamentally from male criminality in terms of its psychological determinants, the level of emotional deprivation involved, and susceptibility to social stigmatization.

Upon their release from correctional institutions, women face a "double stigma"—stemming from their status as former convicts and the loss of traditional social roles associated with womanhood. This situation precipitates a profound personal crisis, frustration, and a risk of recidivism (re-offending). Traditional rehabilitation models tend to focus primarily on external socio-material assistance—such as employment and the restoration of documents—while overlooking the individual's internal psychological potential.

Within the framework of modern psychological anthropology and penitentiary psychology, the social reintegration (resocialization) of women who have served sentences for crimes is a pressing global issue. Female criminality differs fundamentally from male criminality in terms of its psychological determinants, the level of emotional deprivation involved, and susceptibility to social stigmatization.

Female criminality is an issue requiring significant attention in modern society; it is a matter of urgency not only for women themselves but for society as a whole. Addressing the prevention of female criminality requires examining several key factors.[5]

Research indicates that women with lower levels of education are more prone to criminal behavior. It is essential to educate them about their rights and create opportunities for their active participation in social life.

Furthermore, low socio-economic status, a lack of employment opportunities, and financial hardships can drive women toward crime. High unemployment rates limit the capacity to combat female criminality.

Upon their release from penal institutions, women face a "double stigma"—stemming from their status as former convicts and the loss of traditional female roles. This situation triggers deep personal crises, frustration, and a risk of recidivism (re-offending).

In recent years, the Republic of Uzbekistan has implemented sweeping reforms aimed at ensuring human rights—specifically through the humanization of the penal system and the provision of social support for women. Through the Addresses of the President of the Republic of Uzbekistan to the Oliy Majlis and the people of Uzbekistan, as well as decrees and resolutions regarding "fundamental measures to support women and strengthen the institution of the family"[1] and the reform of the penitentiary system, the resocialization of individuals released from penal institutions has been elevated to the level of state policy.

The "Women's Register" system has been implemented in our country to provide targeted support to low-income women, those in need of social protection, and women returning from penitentiary institutions. A mechanism has been established—through the collaboration of the Ministry of Poverty Reduction and Employment and the Committee on Family and Women—to provide vocational training, subsidies, and preferential loans to formerly incarcerated women. However, the effectiveness of these socio-economic reforms depends directly on the internal psychological readiness and the mobilization of personal resources of the women involved. This DSc research serves as a psychological and methodological foundation for the reforms being implemented by the state.

METHODS. The issue of individual rehabilitation within the penitentiary and post-penitentiary systems has a long history of scholarly inquiry and has been conceptually analyzed by various schools of thought and researchers. In this article, we categorize these perspectives into three main approaches and conduct a comparative analysis (Table 1).

Table 1. Comparative analysis of theoretical approaches to the rehabilitation of individuals returning from penitentiary institutions.

Scientific School/Approach	Key Representatives	Conceptual Content and Key Emphases	Problematic/Limited Aspects
Behaviorism and Social Adaptation Theories	B. Skinner, A. Bandura, R. Agnew	Resocialization is the reprogramming of behavior and the internalization of social roles under the influence of external environmental stimuli.	The individual's inner experiences and existential needs are not taken into account.
Concept of Stress and Personal Resources (Resilience)	S. Luthar, M. Rutter, S. Cobb, S. E. Hobfoll	Rehabilitation success depends on an individual's inner resilience and stress-coping resources.	The specific deprivation-related characteristics of the penitentiary system have received little attention.
Local and CIS Schools of Penitentiary Psychology	A. Rean, Yu. Antonyan, M. Salaeva, Kh. Ibragimova	Characteristics of the emotional sphere of incarcerated women, determinants of deviant behavior, and the role of Eastern family values.	Systematic psychological models that go beyond merely describing the problem are scarce.

In international research—specifically within the framework of the "Conservation of Resources Theory"—S.E. Hobfoll emphasizes that individuals facing crisis situations (such as the period following a prison sentence) must protect themselves against the depletion of their internal psychological resources before attempting to mobilize external ones. Similarly, M. Rutter characterizes the phenomenon of resilience (inner fortitude) as a form of "psychological immunity" against external, destructive stigma.

Among scholars in our country, M. Salaeva has investigated the socio-psychological roots of female criminality, demonstrating that emotional deprivation and family conflicts are primary drivers of criminal behavior among women. However, the mechanism for the targeted activation of personal resources (such as internal locus of control and the cognitive envisioning of the future) among women released from penal institutions has not yet been systematically studied.

RESULTS. Psychological issues, stress, and factors affecting mental health can drive women toward criminal activity. It is essential to prioritize mental health.

A lack of gender equality marginalizes women from social life and diminishes the opportunities available to protect them. Ensuring gender equality enhances the capacity to address the issue of women's involvement in crime.

Several measures must be taken to resolve these problems:

First, education and upbringing. It is crucial to provide women with a proper upbringing from a young age, explain their rights and responsibilities, and demonstrate ways to avoid criminal behavior. Enhancing women's social and economic opportunities through education—and fostering their development into independent, self-sufficient individuals—helps reduce crime.

Second, psychological assistance and support. Criminal activity is often linked to mental health issues. Therefore, it is necessary to provide mental health support and conduct stress

management training for women. This helps them find ways to navigate and overcome difficult situations.

Thirdly, gender equality in society. Ensuring equality between women and men and encouraging women's active participation in social life play a vital role in the fight against crime. When gender equality is established, women become more proactive in defending their rights.

Fourthly, cooperation between the government and social organizations. It is essential to establish effective collaboration among the government, non-governmental organizations, and the public to combat crime. Such cooperation enables the development and implementation of programs specifically designed for women.

Preventing female criminality is a task essential to ensuring the stability of our society. This issue can be addressed through education, psychological support, gender equality, and cooperation. It is the duty of each of us to ensure women's safety and encourage their active participation in social life.

DISCUSSION. Research findings confirm that the external socio-material support provided to women returning from penitentiary institutions does not yield the expected social impact unless their internal personal resources are activated. Our results fully support the concept of "resource mobilization during stress" advanced by Western scholars (S.E. Hobfoll, M. Rutter).

It appears that there is a high level of stigmatization (social isolation) directed at women returning from penitentiary institutions in Uzbek society; in such circumstances, a woman's internal psychological resources (resilience, constructive coping) serve as a "psychological shield."

The process of social adaptation for individuals returning from places of deprivation of liberty in the Republic of Uzbekistan rests on a robust legal and regulatory framework. Key documents include:

1. The Penal-Executive Code of the Republic of Uzbekistan[1]: Relevant articles of the Code establish procedures for providing assistance to individuals who have served their sentences, as well as for facilitating their employment and housing arrangements.

2. The Law of the Republic of Uzbekistan "On Population Employment"[2]: Under this law, individuals released from penal institutions are recognized as a category unable to compete on equal terms in the labor market; consequently, a minimum number of jobs (quotas) is reserved for them.

3. Resolution of the President of the Republic of Uzbekistan No. PP-303 dated June 29, 2022: This resolution, titled "On measures to facilitate the social adaptation of citizens who have served their sentences"[3], elevated systemic reforms to an entirely new level. 4. Regulation on the procedure for maintaining the “Women’s Register”[4], approved by Resolution No. 595 of the Cabinet of Ministers dated October 14, 2022: The mechanism for providing targeted assistance to women with a prior criminal record through the “Women’s Register” system was legally established.

The “Women’s Register”[4] mechanism, introduced in Uzbekistan to systematically address issues facing women, is one of the most effective social protection tools for women returning from penitentiary institutions.

CONCLUSION. The large-scale reforms aimed at supporting women in Uzbekistan (such as the "Women's Register" and employment programs) will serve to reduce recidivism and create a stable social environment only when integrated with the model of internal psychological rehabilitation proposed in this article.

The experience of developed nations (e.g., Scandinavian countries, Germany, and Japan) demonstrates that social reintegration programs for inmates begin six months prior to their release. A similar system is being gradually implemented in Uzbekistan; advance meetings are being organized with women nearing release from penitentiary institutions to plan their future housing and employment.

To further improve the system, the following measures are proposed:

1. Promoting social entrepreneurship: Granting greater tax incentives to private enterprises that employ women returning from correctional facilities.

2. Expanding the network of reintegration centers: Establishing temporary shelters and rehabilitation centers for women in every region.

3. Digitalization: Fully integrating the "Women's Registry" (*Ayollar daftari*) with the databases of the Ministry responsible for poverty reduction, enabling the immediate online assignment of social support packages to a woman on the very day of her release.

In conclusion, a comprehensive approach is required to prevent female criminality. This issue can be addressed through education, psychological support, gender equality, and collaboration. It is the duty of each of us to ensure the safety of women in our society and to encourage their active participation in social life.

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ASSESSING MEDICAL STUDENTS' PROFESSIONAL DIGITAL COMPETENCE: CRITERIA, INDICATORS AND DIAGNOSTIC TOOLS

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Abstract. *This article provides a theoretical and methodological rationale for a system to assess the level of medical students' professional digital competence. The study used analysis of the scientific and pedagogical literature, comparative analysis, a systems approach and pedagogical modelling. Based on the structure of competence and the DigComp 2.2 framework, four assessment criteria were identified: motivational-value, cognitive, activity-based and reflective. For each criterion, indicators linked to the five DigComp 2.2 competence areas were developed. Three levels of development (reproductive, productive and creative) were aligned with the DigComp proficiency levels and with Miller's pyramid. A diagnostic tool is proposed for each criterion: a Likert-scale questionnaire, a knowledge test, profession-based case tasks scored with a rubric, and reflective self-assessment based on an e-portfolio. The article describes how the criterion scores are combined into an integral index and how the content validity and reliability of the tools can be checked. Unlike approaches that rely on self-assessment alone, the proposed system also measures students' actual performance. It can be used for entry, interim and final diagnostics in the course "Information Technologies in Medicine".*

Keywords: *Assessment Criteria, Diagnostic Tools, DigComp 2.2, Medical Education, Professional Digital Competence.*

Introduction

Digital competence has become one of the key qualities of a modern specialist. Employers expect graduates to use digital tools for professional purposes consciously and responsibly (Kurakbayeva & Xembayeva, 2025). The European Union's DigComp 2.2 framework describes digital competence in five areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem solving (Vuorikari et al., 2022). In medical education this demand is even stronger. Electronic health records, telemedicine and digital diagnostic systems have entered everyday clinical practice, but curricula are lagging behind these changes (Khurana et al., 2022).

In Uzbekistan, the "Digital Uzbekistan – 2030" Strategy has made the development of students' digital competence a national priority (President of the Republic of Uzbekistan, 2020). The transition to digital learning in higher education is also accelerating (Usmonov, 2024). However, to manage the development process, it must first be measured. If the level of competence

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is not assessed with clear criteria, it is impossible to know which method is effective or in which area a student is falling behind.

Assessing professional competence is a complex task. In medical education, competence is defined as the habitual and judicious use of knowledge, skills, clinical reasoning, values and reflection in daily practice (Epstein & Hundert, 2002). In the pedagogical literature, too, competence is seen as an integral quality manifested in activity (Khutorskoy, 2003; Zimnyaya, 2003). Therefore, it cannot be fully measured with a single test or questionnaire.

In many current studies, students' digital competence is measured mainly through self-assessment questionnaires (Mejías-Acosta et al., 2024; Zhao et al., 2021). Most instruments developed for health professionals also rely on self-assessment (Mainz et al., 2024). This approach shows students' perceptions of themselves but does not always reflect their actual performance. In medical education, it is recommended that competence be assessed not with a single method but through a programme of methods (van der Vleuten & Schuwirth, 2005). A multi-component assessment system for professional digital competence that is aligned with DigComp 2.2 and adapted to the medical context has not yet been sufficiently developed.

The aim of this study is to provide a theoretical and methodological rationale for the criteria, indicators, levels and diagnostic tools for assessing medical students' professional digital competence. The objectives are: (1) to determine the structure of professional digital competence and identify the corresponding assessment criteria; (2) to develop indicators for each criterion linked to the DigComp 2.2 areas; (3) to describe the levels of development and align them with the DigComp proficiency levels; and (4) to propose a set of diagnostic tools and a procedure for combining the results into an integral index.

Method

The study is theoretical and methodological. It used analysis of the scientific and pedagogical literature, comparative analysis, a systems approach and pedagogical modelling.

Theoretical Foundations

The assessment system was based on four sources. The first is the development of the DigComp framework: the original DigComp model (Ferrari, 2013), DigComp 2.1, which introduced eight proficiency levels (Carretero et al., 2017), and DigComp 2.2, which added examples of knowledge, skills and attitudes (Vuorikari et al., 2022). The second is the DigCompEdu framework for educators, from which approaches to assessment were taken (Redecker, 2017). The third is Miller's pyramid, widely used in medical education, which divides competence into the levels "knows", "knows how", "shows how" and "does" (Miller, 1990). The fourth is the competence-based approach, which interprets competence as an integral unity of knowledge, skills, values and reflection (Epstein & Hundert, 2002; Khutorskoy, 2003; Zimnyaya, 2003).

Selection of Literature

The analysis included digital competence frameworks, instruments for measuring the digital competence of university students and health professionals, and studies on competence assessment in medical education. The main focus was on international sources published in 2013–2025.

Procedure for Developing the System

The assessment system was built in four steps: (1) identifying criteria based on the components of competence; (2) formulating indicators for each criterion linked to the DigComp 2.2 areas; (3) describing the levels of development; and (4) selecting a suitable diagnostic tool for

each criterion. It is envisaged that the content validity of the tools will be determined using Lawshe's method (content validity ratio) (Lawshe, 1975) and the weights of the criteria through expert assessment based on the Delphi method (Hsu & Sandford, 2007).

Results

Assessment Criteria and Indicators

Professional digital competence consists of four interrelated components, so assessment is also carried out according to four criteria (Table 1). Each criterion corresponds to a particular level of Miller's pyramid (Miller, 1990; Figure 1). In this way, the system separately measures what students know, what they can do and what attitudes they hold.

Table 1. Criteria and Indicators for Assessing Professional Digital Competence

Criterion	What it measures	Main indicators	Miller level
Motivational-value	Understanding of the professional value of digital technologies; readiness to use them	Interest in digital medicine; willingness to learn digital tools; accepting patient data confidentiality as a value	– (attitude)
Cognitive	Knowledge in the DigComp 2.2 areas	Knowledge of medical information sources, data types, cybersecurity rules and digital health systems	"Knows", "Knows how"
Activity-based	Practical use of digital tools in professional situations	Finding and evaluating reliable sources; analysing a data table; creating medical content; anonymising data	"Shows how"
Reflective	Analysing and improving one's own digital activity	Identifying strengths and weaknesses; analysing mistakes; drawing up a personal development plan	– (self-regulation)

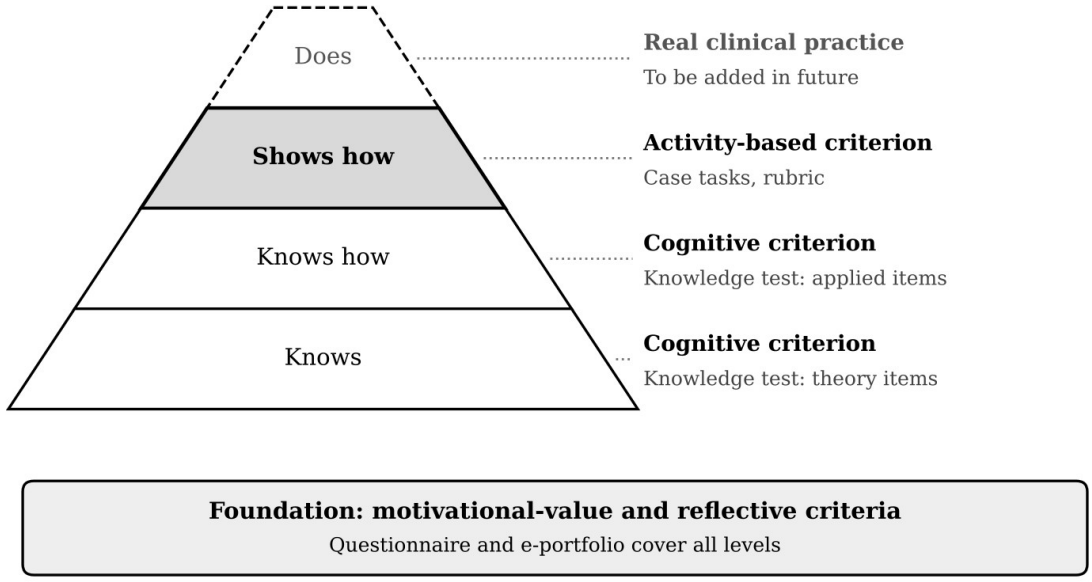


Figure 1. Alignment of the Assessment Criteria With the Levels of Miller's Pyramid

The indicators of the cognitive and activity-based criteria are divided according to the five DigComp 2.2 areas (Table 2). This makes it possible to analyse the results both overall and for each area.

Table 2. Indicators by DigComp 2.2 Area (Medical Education Example)

DigComp 2.2 area	**Cognitive indicator (test)**	**Activity-based indicator (case task)**
Information and data literacy	Knowledge of medical databases and evidence-based sources	Finding and comparing reliable sources on a disease
Communication and collaboration	Knowledge of professional digital communication and telemedicine rules	Preparing a clinical case description as a team in a shared cloud document
Digital content creation	Knowledge of data visualisation and copyright rules	Creating an infographic or presentation for patients
Safety	Knowledge of personal medical data protection requirements	Anonymising a set of patient data
Problem solving	Knowledge of data processing methods	Analysing a table of clinical data and drawing conclusions

Levels of Development

Three levels of development were identified. They were aligned with the eight proficiency levels of DigComp 2.1 and 2.2 (Carretero et al., 2017; Vuorikari et al., 2022), as shown in Table 3.

Table 3. Description of the Levels of Development

Level	**Description**	**DigComp proficiency level**	**Integral index (K)**
Reproductive (low)	Performs simple tasks following a model and with help; does not fully understand the professional value of digital tools	1–2 (foundation)	$K < 0.50$
Productive (medium)	Performs standard professional tasks independently; can choose a tool according to the situation	3–4 (intermediate)	$0.50 \leq K < 0.75$
Creative (high)	Finds solutions in non-standard situations, helps others, analyses and improves own activity	5–6 (advanced)	$K \geq 0.75$

Diagnostic Tools

Each criterion is measured with a suitable tool (Table 4). This combination of tools corresponds to the "programme of methods" approach recommended in medical education (van der Vleuten & Schuwirth, 2005).

Table 4. Diagnostic Tools by Criterion

Criterion	Diagnostic tool	Structure	Assessed by
Motivational-value	Questionnaire	15 items, 5-point Likert scale	The student
Cognitive	Knowledge test	25 test items (5 per area)	Automatically (via LMS)
Activity-based	Professional case tasks	5 tasks (1 per area), 4-point rubric scale	Teacher (two raters)
Reflective	E-portfolio and reflective journal	Self-assessment sheet and written reflection	Student and teacher

The activity-based criterion is the central part of the system because it shows the student's actual skills. Case tasks are assessed according to a rubric announced in advance. Each rubric criterion should be clear and observable (Brookhart, 2018). Rubrics serve not only for scoring but also for giving feedback to students (Panadero & Jonsson, 2013). Active, student-centred tasks engage almost all areas of digital competence (Nikolova et al., 2024), which makes them suitable situations for observing it. The agreement between the ratings of the two teachers is checked.

Calculating the Integral Index

The result for each criterion is normalised to the range from 0 to 1 (the score obtained is divided by the maximum score). The integral index is then calculated taking into account the weights of the criteria (Figure 2):

$$K = w1 \cdot km + w2 \cdot kc + w3 \cdot ka + w4 \cdot kr, \quad where\ w1 + w2 + w3 + w4 = 1 \qquad (1)$$

Here km, kc, ka and kr are the normalised results for the motivational-value, cognitive, activity-based and reflective criteria, respectively, and w1…w4 are the weights of the criteria. It is recommended that the activity-based criterion be given the greatest weight because it directly reflects actual competence. The following weights are proposed as an initial example: w1 = 0.20; w2 = 0.25; w3 = 0.35; w4 = 0.20. The final values are determined by expert consensus using the Delphi method (Hsu & Sandford, 2007).

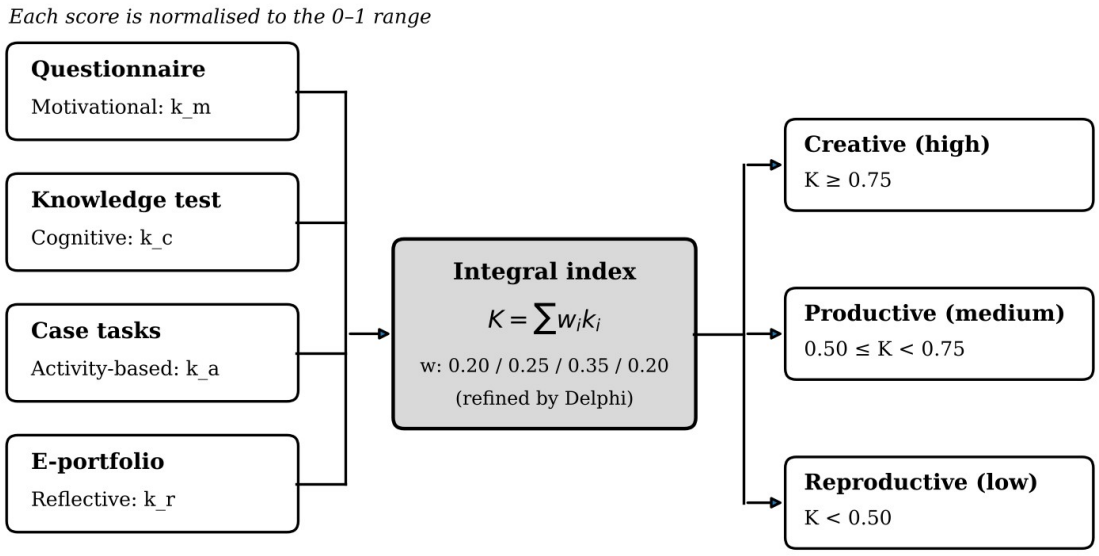


Figure 2. Scheme for Determining the Integral Index and the Level of Development

Ensuring the Quality of the Tools

Before the tools are used, their quality is checked in three ways. First, content validity: at least five to seven experts evaluate the necessity of each item, and Lawshe's content validity ratio is calculated (Lawshe, 1975). Second, reliability: Cronbach's alpha is calculated for the questionnaire and the test, and $\alpha \geq 0.70$ is considered acceptable (Tavakol & Dennick, 2011). Third, inter-rater agreement: case tasks are scored independently by two teachers, and the level of agreement between them is determined.

Diagnostics are carried out three times during the semester: entry (at the beginning), interim (in the middle) and final (at the end). This makes it possible to follow the dynamics of the student's development and to adjust teaching in good time (Figure 3).

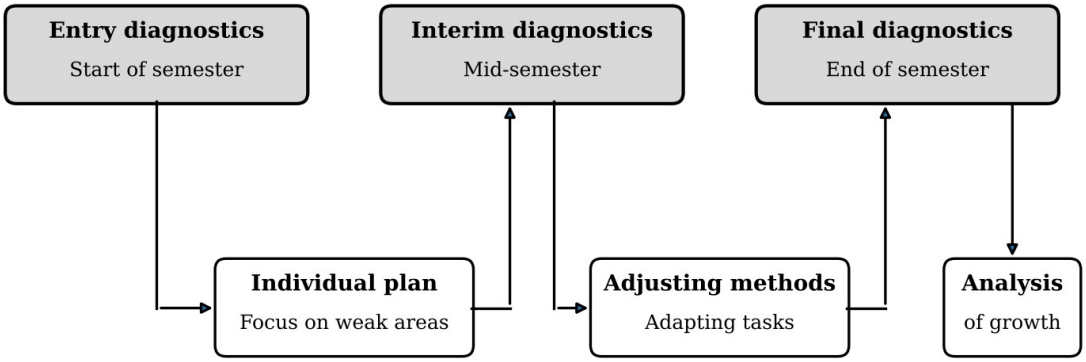


Figure 3. Diagnostic Cycle During the Semester and Use of the Results

Discussion

The main feature of the proposed system is that it measures competence from several sides. Many existing instruments rely only on self-assessment (Mainz et al., 2024; Mejías-Acosta et al., 2024). Such instruments are convenient and quick, but students may overestimate or underestimate their level. In the proposed system, self-assessment is retained (motivational-value and reflective criteria), but it is complemented by a knowledge test and case tasks assessed by the teacher. This is consistent with the approach accepted in medical education: competence should be assessed not with a single "ideal" instrument but through a programme of complementary methods (van der Vleuten & Schuwirth, 2005).

The use of Miller's pyramid makes the system familiar to medical educators (Miller, 1990). Medical teachers already rely on this pyramid when assessing clinical skills. Assessing digital competence with the same logic brings it into one system with clinical subjects. Project tasks carried out with cloud tools have also been used to develop and observe professional competencies in practice (Spirina et al., 2025). At the same time, the top level of the pyramid, "does", that is, assessment in real clinical practice, is not yet included in the system. It can be added in the future through observation during clinical placements.

The system also places demands on the teacher's digital competence. Designing rubrics, running tests through an LMS and analysing e-portfolios require appropriate preparation. However, the digital competence of university teachers is still uneven (Inamorato dos Santos et al., 2023). For this reason, short training seminars for teachers are advisable before the system is introduced.

The scientific novelty of the study is as follows. First, the five DigComp 2.2 areas were combined with the four components of competence, and a system of indicators adapted to medical education was developed. Second, the levels of development were aligned with the DigComp proficiency levels and Miller's pyramid. Third, a procedure for combining criterion scores into an integral index and for checking the quality of the tools was proposed.

The study also has limitations. The article is theoretical and methodological. The weights of the criteria and the level thresholds are initial proposals and should be refined through expert assessment and empirical testing. Future studies are planned to test the validity and reliability of the tools on a sample of medical students and to confirm the structure of the criteria through factor analysis.

Conclusion and Implications

Four criteria are needed for a complete assessment of medical students' professional digital competence: motivational-value, cognitive, activity-based and reflective. The indicators of each criterion are linked to the five DigComp 2.2 areas and adapted to the medical context. Three levels of development – reproductive, productive and creative – were aligned with the DigComp proficiency levels. Each criterion is measured with a suitable tool: a questionnaire, a knowledge test, case tasks scored with a rubric and an e-portfolio. The results are combined into a weighted integral index.

Several practical implications follow. First, diagnostics with the proposed tools should be carried out at the beginning, middle and end of the semester in "Information Technologies in Medicine". Second, rubrics for case tasks should be developed in advance and announced to students. Third, the content validity of the tools should be checked with experts before they are introduced. Fourth, based on the diagnostic results, an individual development plan by DigComp 2.2 area should be drawn up for each student.

Declarations

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PEER REVIEW AS A FACTOR IN IMPROVING THE QUALITY OF DIGITAL RESOURCES CREATED BY UNIVERSITY STUDENTS

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Abstract. *This article examines the pedagogical potential of peer review for improving the quality of digital learning resources created by university students. Peer review is substantiated as a formative assessment tool that develops students' competence in creating digital resources. A five-stage model for the peer review of digital resources was developed, together with an assessment rubric covering content, didactic, technological-design and legal-ethical criteria. Practical classes were organised using the Workshop module of LMS Moodle. The results showed that the quality of resources revised after peer review improved considerably, most notably on the didactic and legal-ethical criteria, and that most students found reviewing their peers' work helpful for identifying weaknesses in their own resources.*

Keywords: *peer review, peer assessment, digital resource, formative assessment, feedback, assessment rubric, digital competence, LMS Moodle, Workshop module.*

INTRODUCTION

In the context of the digital transformation of education, higher education graduates are expected not only to use ready-made digital tools but also to create high-quality digital learning resources independently. The Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030, approved by Presidential Decree No. PF-5847 of 8 October 2019, identifies the wide introduction of digital technologies and electronic learning resources into the educational process as a priority [1]. In the European Union's DigComp 2.2 framework, "digital content creation" is one of the five key areas of citizens' digital competence [2], while the DigCompEdu framework for educators treats the creation and modification of digital resources as a distinct competence [3].

In practice, however, the quality of digital resources created by students often falls short of expectations: learning objectives are not clearly stated, content is overloaded, interactive elements and feedback mechanisms are lacking, and copyright requirements are not observed. The author's previous research has also shown that students tend to focus on the technical side of resource creation while paying insufficient attention to its didactic foundations [4]. In such conditions, the teacher's final grade records the quality of a resource but does little to improve it. It is therefore important to find mechanisms that raise quality during the creation process itself and place the student in the active role of evaluator.

One such mechanism is peer review (peer assessment). K. Topping defines peer assessment as "an arrangement in which individuals consider the amount, level, value, worth, quality or success of the products or outcomes of learning of peers of similar status" and has demonstrated its effectiveness in higher education on the basis of numerous studies [5; 6]. The meta-analysis by N.

Falchikov and J. Goldfinch confirmed that peer marks agree reasonably well with teacher marks, particularly when clear criteria are provided [7]. Meta-analyses by H. Li et al. and K. Double et al. found that peer assessment has a positive effect on students' learning outcomes [8; 9].

A key feature of peer review is that both the receiver and the giver of feedback benefit from it. K. Lundstrom and W. Baker found that students who reviewed their peers' writing improved their own writing more than students who only received feedback [10]. D. Nicol et al. explain this by the fact that, in reviewing others' work, students develop a conception of quality and begin to view their own work critically [11]. D. R. Sadler emphasised that learners cannot improve the quality of their work unless they understand the standard and can compare their work against it [12]. J. Hattie and H. Timperley identified feedback as one of the most powerful influences on learning outcomes [13].

The author's earlier studies examined the requirements for developing students' competence in creating digital resources [14], modern pedagogical approaches to developing this competence [15], and gender differences in its development [16]. However, the content, stages and assessment criteria of peer review of student-created digital resources have not been specifically investigated. International research has focused mainly on written work (essays, papers), and the specific features of assessing multimedia and interactive digital resources remain insufficiently addressed.

The aim of this study is to substantiate peer review theoretically as a factor in improving the quality of digital resources created by students, to develop a model for organising it and an assessment rubric, and to test their effectiveness in practice.

MATERIALS AND METHODS

The study used theoretical methods (analysis and synthesis of international and national literature on peer assessment and formative assessment, modelling) and empirical methods (pedagogical observation, questionnaire survey, rubric-based expert assessment of student-created resources, and a pedagogical experiment).

The study was conducted at Kokand State University during practical classes with undergraduate students. Students created a digital learning resource on a topic of their choice (an interactive presentation, a set of H5P activities, a short instructional video or a learning module in LMS Moodle). Peer review was organised using the Workshop module of LMS Moodle, which supports submission of work, automatic or manual allocation of submissions to reviewers, rubric-based assessment, and grading of the reviewers themselves according to the quality of their assessments [17].

Resource quality was assessed twice on a 100-point scale using the developed rubric (Table 2): the initial version before peer review and the revised version after it. Assessment was carried out by the teacher and one independent expert. At the end of the classes, a questionnaire survey was administered to collect students' opinions.

RESULTS

1. The essence of peer review of digital resources. Based on the analysis, the following working definition was formulated: peer review of digital resources is an organisational and pedagogical process in which students, using pre-agreed criteria, analyse the content, didactic, technological and legal quality of digital learning resources created by their peers, provide reasoned feedback, and improve their own resources on the basis of the feedback received.

Three main functions of peer review follow from this definition. The **diagnostic function** identifies the strengths and weaknesses of a resource. The **developmental function** shapes

students' understanding of quality standards and develops their evaluative thinking. The **improvement function** ensures that the resource is refined on the basis of feedback. As N.-F. Liu and D. Carless point out, the main value of peer assessment lies not in grading but in the learning element of feedback, that is, in meaningful dialogue between students [18].

Reviewing digital resources differs from assessing written work in several respects. First, a resource consists of multiple components – text, images, video, audio and interactive elements – so the reviewer must evaluate content, didactics and design at the same time. Second, a resource is designed for interaction with the user, which means the reviewer has to try it out from the learner's perspective. Third, copyright, licensing and accessibility issues are especially important for digital resources.

2. A model for organising peer review. Drawing on L. S. Vygotsky's idea of the zone of proximal development [19], formative assessment theory [12; 13] and international experience of peer assessment [5; 6; 11], a five-stage model for the peer review of digital resources was developed (Table 1).

Table 1. Stage-based model for the peer review of digital resources

Stage	Content	Student activity	Outcome
1. Preparation	Introducing the criteria and rubric; joint assessment of sample resources (calibration)	Studies the criteria, assesses samples and compares own scores with the teacher's	A shared understanding of the quality standard
2. Creation and submission	Creating the initial version and uploading it to the Workshop module	Creates the resource and writes a brief note (aim, target audience)	Initial version of the resource
3. Review	Anonymous allocation of each resource to 2–3 reviewers; rubric-based assessment	Tries out the resource, scores it against the rubric, writes recommendations	Scores and reasoned feedback
4. Revision	Analysing feedback and revising the resource	Prioritises recommendations, improves the resource, lists the changes made	Final version of the resource
5. Reflection and final assessment	Teacher's assessment, grading of reviewers, reflection	Writes a reflective essay and analyses own progress	Final grade and reflection results

The first stage, **calibration**, is particularly important. Research shows that when students interpret the criteria differently, their scores diverge substantially from the teacher's and their feedback remains superficial [7]. Students therefore first assessed two or three sample resources of varying quality using the rubric, compared their results with the teacher's scores and discussed the differences.

At the third stage, **anonymity** of the review was ensured. This encourages students to assess objectively, free from the influence of friendship or personal conflict. Each resource was reviewed by at least two reviewers, which increases the reliability of the scores. Feedback had to

follow a “strength – weakness – specific recommendation” structure, which prevented generic comments such as “good” or “great”.

3. The assessment rubric. The rubric was developed on the basis of the “digital content creation” area of DigComp 2.2 [2], the requirements substantiated in the author’s previous study [14], and recommendations on the use of rubrics for formative assessment [20] (Table 2).

Table 2. Rubric for the peer review of digital resources

Criterion	Indicators	Points
Content	Scientific accuracy and relevance of information, alignment with learning objectives, logical coherence	25
Didactic	Clear learning objectives, appropriately chunked information, interactive tasks, feedback and self-check opportunities	30
Technological-design	Visual consistency, readability, appropriateness of multimedia elements, ease of navigation, technical functionality	30
Legal-ethical	Citation of sources, compliance with copyright and licences (Creative Commons), accessibility	15
Total		100

Each criterion was described at four levels (“high”, “sufficient”, “partial” and “insufficient”). Clear level descriptors show students not only what score to give but also how the resource can be improved; the rubric thus serves simultaneously as an assessment tool and a teaching tool.

4. Practical results. The mean quality score of resources revised after peer review increased from 61.8 to 78.4 points. The greatest gains were observed on the didactic criterion (owing to the addition of interactive tasks and feedback elements) and the legal-ethical criterion (owing to source citations and licence information). After the calibration stage, the agreement between student and teacher scores was considerably higher ($r = 0.71$). According to the survey, 82% of students stated that assessing others’ resources helped them see weaknesses in their own, and 76% reported that the feedback they received was useful for improving their resource.

DISCUSSION

The results indicate that peer review is an effective factor in improving the quality of digital resources created by students. This conclusion is consistent with meta-analytic evidence on the positive effects of peer assessment [8; 9]. At the same time, the study shows that this effect is not limited to written work but extends to multi-component multimedia resources.

The substantial gain on the didactic criterion deserves attention. When creating their own resources, students often focus on presenting information and overlook interaction with the learner. A reviewer who tries out a peer’s resource from the learner’s perspective, however, immediately notices the lack of interactivity and feedback. This supports the “learning by giving feedback” effect reported by K. Lundstrom and W. Baker and by D. Nicol et al. [10; 11]: assessing others’ work helps students build an internal standard of quality.

The results on the legal-ethical criterion are also important. Students are often observed paying insufficient attention to copyright when using images and materials taken from the internet. Including this criterion explicitly in the rubric, and having reviewers check it systematically,

helped develop students' digital ethics and information culture. This confirms in practice the need, put forward in the author's earlier studies, to develop the legal-ethical component of competence in creating digital resources [14; 15].

Several difficulties were also identified in implementing peer review. First, some students initially expressed distrust of their peers' assessments; this was addressed through anonymity, the involvement of several reviewers and the teacher's final oversight. Second, without the calibration stage, student scores varied widely and feedback tended to be superficial, so this stage should be regarded as a mandatory part of the model. Third, peer review requires additional time, but the automated features of the Moodle Workshop module considerably reduce the teacher's workload.

A limitation of the study is that it was conducted at a single higher education institution. Promising directions for future research include combining peer review with preliminary automated analysis using artificial intelligence and organising interdisciplinary peer review among students of different programmes.

CONCLUSION

The study leads to the following conclusions:

1. Peer review of digital resources is a formative assessment tool that performs diagnostic, developmental and improvement functions; it moves students from the position of passive authors of learning products to that of active evaluators and improvers.

2. The developed five-stage model (preparation and calibration, resource creation, anonymous review, revision, reflection) and the four-criterion rubric (content, didactic, technological-design, legal-ethical) enable peer review to be organised systematically and reliably.

3. The quality of resources revised after peer review increased considerably, particularly on the didactic and legal-ethical criteria, and most students reported that assessing others' work helped them improve their own resources.

4. The Workshop module of LMS Moodle automates the organisation of peer review, the allocation of submissions and the calculation of grades, making the method applicable to large groups.

The findings can be used in teaching information technology and digital education technology courses in higher education institutions, in developing e-learning courses, and in professional development programmes for teachers.

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PEDAGOGICAL OPPORTUNITIES FOR DEVELOPING STUDENTS' DIDACTIC CREATIVITY IN THE CONTEXT OF A PEDAGOGICAL EDUCATION CLUSTER

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Abstract. *The growing complexity of teaching requires future teachers not only to master established pedagogical methods but also to make independent and creative didactic decisions. This article examines the pedagogical opportunities for developing students' didactic creativity within a pedagogical education cluster. Didactic creativity is interpreted as the ability of a future teacher to generate, adapt, justify, test and improve pedagogically appropriate solutions concerning learning objectives, content, methods, tasks, resources, interaction and assessment. The study uses theoretical analysis, comparison, generalization and conceptual synthesis of research on creative pedagogy, design thinking, teacher education and the cluster approach. The analysis identifies five mutually connected opportunities of the cluster environment: integration of university preparation with authentic school practice; mentoring and professional dialogue; problem-oriented didactic design; systematic reflection based on evidence; and access to an open innovative environment that combines human, methodological and digital resources. A conceptual mechanism is proposed in which a student repeatedly moves from a real pedagogical problem to the generation of alternatives, testing, feedback, reflection and redesign. The article argues that the educational value of a cluster does not lie in institutional cooperation alone. Its developmental effect appears when cooperation is translated into recurring professional situations in which students are expected to make, explain and revise their own didactic decisions. The identified conditions may be used in the design of pedagogical practice, methodology courses, microteaching, mentoring and project-based work in teacher education institutions.*

Keywords: *pedagogical education cluster, didactic creativity, future teacher, creative thinking, didactic design, pedagogical practice, mentoring, reflective practice.*

INTRODUCTION

Teacher education increasingly operates in circumstances in which professional competence cannot be reduced to the reproduction of established methods. A lesson is always situated: learners differ in prior knowledge, motivation, pace, language experience and ways of participating; curriculum requirements must be interpreted rather than merely repeated; and teachers often have to decide what to change while instruction is already in progress. For this reason, the professional quality of a future teacher depends not only on what pedagogical techniques he or she knows, but also on the ability to construct an appropriate response when a familiar technique does not fully fit the situation.

This problem brings creativity into the centre of didactic preparation. In the PISA 2022 framework, creative thinking is described as a developable capacity involving the generation, evaluation and improvement of ideas that can lead to original and effective outcomes [1]. In

teacher education, this logic has a direct professional meaning. A teacher continuously works with ideas: how to introduce a concept, how to formulate a question, how to transform content into a learning task, how to organize interaction, how to support a learner who is struggling, and how to determine whether the intended learning has actually occurred. The creative dimension of these decisions is not decorative. It is part of the teacher's ability to adapt instruction responsibly.

For the purposes of this study, didactic creativity is defined as a future teacher's capacity to generate, adapt, justify, test and improve pedagogically appropriate solutions related to the objectives, content, methods, forms, tasks, resources, interaction and assessment of learning. Two characteristics of this definition are important. First, novelty by itself is not sufficient: an unusual method that does not contribute to learning cannot be regarded as a strong didactic decision. Second, creativity is treated as a process that includes revision. A student may produce an original lesson idea, but professional creativity becomes visible when that idea is compared with the needs of learners, tested in practice, evaluated and improved.

The central difficulty is that didactic creativity cannot be formed only through explanations about creativity. If methodology courses are dominated by ready-made schemes and students are rewarded mainly for reproducing a model lesson correctly, the educational environment unintentionally teaches dependence on prescribed solutions. A different learning architecture is required: students need access to authentic problems, professional dialogue, trial, feedback and repeated redesign. The pedagogical education cluster is potentially important precisely because it can connect the university, schools, experienced teachers, researchers, methodological centres and other educational actors within one professional space [5; 6].

In Uzbekistan, the cluster approach has been developed as a mechanism for strengthening integration and continuity in pedagogical education. Research on educational clusters emphasizes cooperation among institutions, the combination of scientific and practical resources and the reduction of the gap between teacher preparation and the real needs of schools [5-8]. Yet the existence of institutional links does not automatically develop student creativity. The decisive issue is pedagogical: what kinds of experiences become possible inside the cluster, and how should they be organized so that students learn to make their own didactic decisions? The purpose of the article is therefore to identify and theoretically substantiate the pedagogical opportunities through which a pedagogical education cluster can support the development of students' didactic creativity.

LITERATURE REVIEW

Research on creative pedagogy indicates that creativity develops most consistently in learning environments that combine agency, dialogue, collaboration, problem solving, exploration and opportunities to test possibilities. Cremin and Chappell's systematic review shows that creative pedagogies are not defined by a single method; rather, they are characterized by relationships and learning conditions that allow learners to take intellectual initiative while remaining engaged with disciplinary goals [2]. This distinction is useful for teacher education. Future teachers do not become didactically creative because they are given a list of "creative techniques"; they develop creativity when the structure of their preparation requires them to interpret uncertain situations and take responsibility for reasoned choices.

Recent research on design thinking in teacher education provides a more specific explanation of this process. Baran and AlZoubi found that participation in design-thinking activities changed preservice teachers' understanding of their professional role, encouraging them to see teachers as designers, innovators and change agents rather than as users of fixed instructional procedures [3]. The significance of this shift lies in the change of professional position. When a

student begins to regard a lesson as something that can be designed, tested and redesigned, the relationship with methodological knowledge changes as well: methods become resources for solving pedagogical problems rather than prescriptions to be followed mechanically.

Albay and Eisma provide empirical support for the connection between design thinking and the quality of preservice teachers' lesson planning. In their study, students who engaged in a structured design-thinking process produced stronger and more interactive teaching plans than those in the comparison group [4]. The result is important not because design thinking should replace other approaches, but because it illustrates a more general principle: creativity grows when students work on authentic performance tasks, gather information from users and professionals, develop alternatives, receive feedback and revise their product. These are also processes that a pedagogical cluster can make more regular and realistic.

The cluster literature in Uzbekistan adds an organizational dimension to this discussion. Khodjamkulov and colleagues describe cluster-based cooperation as a means of integrating institutions and creating stronger relationships among participants in the educational system [5]. Khodjamkulov's work on the innovative pedagogical education cluster further emphasizes the need for a coordinated environment in which pedagogical institutions and practice bases are linked around common goals [6]. Makhmudov and co-authors similarly treat the cluster as an approach that can improve continuity and interaction in pedagogical education [7]. More recent analysis by Tokhirova highlights the role of university-school cooperation and the possibility of narrowing the traditional distance between theoretical preparation and school practice [8].

These two bodies of literature - creativity-oriented teacher education and cluster-based pedagogical education - are usually discussed separately. The first explains how creative professional thinking can be stimulated; the second explains how institutions and resources can be connected. The present study connects them conceptually. The cluster is interpreted not simply as an administrative network but as a professional learning ecology. Its pedagogical value depends on whether institutional cooperation produces recurring situations in which students encounter real problems, work with experienced participants, design instructional responses, receive evidence about the effects of those responses and refine their decisions.

MATERIALS AND METHODS

The article is a theoretical-analytical study. It does not report an experimental intervention and therefore does not present invented respondents, percentages or statistical effects. The methodological basis consists of theoretical analysis, comparison, generalization and conceptual synthesis. Sources were selected from four overlapping areas: contemporary conceptions of creative thinking; research on creative pedagogy; design-oriented approaches in preservice teacher education; and studies of pedagogical education clusters, particularly those related to the Uzbek context.

The analytical procedure was organized in three stages. At the first stage, the functional characteristics of didactic creativity were identified by translating general processes of creative thinking into the professional tasks of teaching. At the second stage, the resources and forms of interaction made possible by a pedagogical education cluster were examined. At the third stage, the two sets of characteristics were compared in order to determine where a cluster resource can become a developmental mechanism for didactic creativity. The criterion for identifying a pedagogical opportunity was not the mere presence of cooperation, but the possibility of organizing student activity around independent didactic choice, testing, feedback and revision.

As a result of this synthesis, five interconnected pedagogical opportunities were identified: (1) integration of theoretical preparation with authentic school practice; (2) mentoring and collaborative professional dialogue; (3) problem-oriented didactic design; (4) reflective practice based on evidence; and (5) participation in an open innovative environment. These opportunities are discussed below as elements of one developmental mechanism rather than as isolated techniques.

RESULTS AND DISCUSSION

1. Integration of theoretical preparation with authentic pedagogical practice

The first and most fundamental opportunity is the creation of a continuous relationship between university learning and authentic school practice. In a conventional arrangement, theory and practice may be separated in time: students first learn methods at the university and only later attempt to apply them during a limited practice period. Such sequencing can produce a false impression that professional activity consists of finding the correct method in a previously learned list. Real classrooms demonstrate the opposite. The same method can work differently depending on the group, the task, timing, language, classroom climate and learners' previous experience.

A cluster allows school situations to enter university learning earlier and more systematically. Classroom observations, lesson fragments, learner work, assessment samples and teacher dilemmas can become material for methodological analysis. Students can identify why a lesson episode became difficult, propose several responses, compare those responses with pedagogical principles and then test an improved version in microteaching or school practice. The learning unit is therefore not a method in isolation but a professional problem that requires interpretation.

For didactic creativity, this shift is essential. Authentic problems contain uncertainty, and uncertainty creates a reason to generate alternatives. If every assignment has one pre-established answer, originality is unnecessary. When a student must adapt one concept for learners with different preparation levels, redesign a task after weak engagement, or explain the same content through different representations, creative thinking becomes functionally connected with professional competence. The cluster provides the environment in which such problems can be encountered repeatedly rather than occasionally.

2. Mentoring and collaborative professional dialogue

The second opportunity arises from access to different professional perspectives. A pedagogical cluster can bring together university lecturers, school teachers, methodologists, researchers and students. Their value for creativity does not lie simply in increasing the number of people involved. The important factor is the possibility of comparing different interpretations of the same didactic situation. An experienced teacher may notice classroom management, a methodologist may focus on the learning objective, a subject specialist may identify a conceptual difficulty, while the student may explain the intention behind the original lesson design.

Such dialogue broadens the solution space. Creativity research consistently treats the generation of alternatives as a central process [1; 2]. In teacher education, alternatives are strengthened when students have to explain why a particular decision is preferable under particular conditions. Mentoring is therefore most developmental when it avoids giving an immediate recipe. A mentor who asks, "What evidence made you change the task?", "What else could you try?", or "How would this work with a different group?" encourages the student to think in possibilities while maintaining professional justification.

Peer collaboration has a related function. Joint lesson design and microteaching expose students to solutions they would not necessarily generate alone. However, collaborative creativity requires structure. If group work simply divides the lesson plan into separate parts, it may produce little professional dialogue. More useful formats require students to propose competing versions, defend criteria for selection and merge strong elements into a revised design. In this way, collaboration becomes a mechanism for expanding and evaluating didactic ideas rather than merely distributing workload.

3. Problem-oriented didactic design

The third opportunity concerns the character of learning tasks. Didactic creativity cannot be expected to develop through assignments that mainly demand reproduction. Students need design problems in which the objective is clear but the route is open. Examples include designing three ways to teach a difficult concept, transforming a textbook exercise into an inquiry task, adapting a lesson for a mixed-ability group, constructing formative assessment that reveals misconceptions, or redesigning a low-engagement activity after observing pupils' responses.

Design-thinking research is useful here because it makes iteration explicit. In studies with preservice teachers, the process of understanding users, defining a problem, generating possibilities, creating a prototype and revising it has been associated with stronger design orientations and more creative teaching plans [3; 4]. These stages can be translated into teacher education without turning the course into a rigid design-thinking template. The central pedagogical principle is that a student's first solution should not be treated as the final product.

Within the cluster, design tasks become especially meaningful because the intended users are accessible. Students can discuss a proposed task with school teachers, observe learners for whom the task is intended, pilot a fragment and collect responses. Consequently, the phrase "student-centred lesson" moves from a general slogan to a concrete design requirement. The future teacher must ask who the learners are, what difficulty they are likely to experience, how the activity will reveal their thinking and what modification would make the learning process more accessible without simplifying the educational goal.

4. Reflective practice based on evidence

The fourth opportunity is systematic reflection. Creativity becomes professionally valuable only when ideas are subjected to evaluation. In teaching, the criterion is not whether an activity appeared interesting to the teacher, but whether it created conditions for the intended learning. Reflection should therefore be connected with evidence: learner responses, questions, errors, completed tasks, timing, participation patterns and assessment results.

A cluster makes it possible to organize reflection as a shared routine across university and school settings. After microteaching or practice lessons, students can compare their intended design with what actually occurred. They can identify which element of the lesson supported understanding, where learners became uncertain, whether instructions produced the expected action and which students were excluded from participation. The goal is not to produce a general statement such as "the lesson went well," but to reconstruct the relationship between a didactic decision and its observable consequences.

This form of reflection strengthens didactic creativity because it gives direction to improvement. Without evidence, redesign can become arbitrary: students change activities simply to make them different. With evidence, revision becomes purposeful. A question is shortened because learners interpreted it ambiguously; a group task is restructured because one student

dominated the discussion; an example is replaced because it activated an incorrect analogy. Creative revision thus becomes a form of professional reasoning.

5. Open innovative environment and access to distributed resources

The fifth opportunity is the creation of an open educational environment in which resources are distributed across institutions rather than confined to a single classroom. The cluster model is built on integration of human, scientific, methodological and practical capacities [5-8]. For students, this can mean access to experienced teachers, laboratories, school data, digital tools, methodological collections, research seminars, demonstration lessons and interdisciplinary expertise. Such access is especially important when students are expected to construct rather than merely consume teaching solutions.

Digital resources broaden this opportunity further, but technology should not be equated with creativity. A new platform or application does not automatically produce a new didactic idea. Its value depends on the pedagogical problem it helps to solve. Within the cluster, students can compare digital and non-digital solutions, test accessibility, examine learner response and decide when technology adds genuine instructional value. This protects creative teaching from becoming a search for novelty for its own sake.

An open environment also normalizes professional experimentation. Students are more likely to propose and test ideas when error is treated as information rather than as evidence of incompetence. This does not mean lowering academic standards. On the contrary, experimental freedom should be paired with stronger justification: the student is permitted to try an alternative, but must explain its purpose, observe its effects and revise it responsibly. Such a culture is one of the conditions that transforms a cluster from an organizational structure into a developmental environment.

A conceptual mechanism for developing didactic creativity

The identified opportunities can be integrated into a single recurring mechanism. The starting point is not a request to "be creative," but an authentic pedagogical problem. The student studies the context, formulates the didactic difficulty, generates several alternatives, selects and justifies one solution, tests it in a protected or real practice setting, receives feedback, analyzes evidence and redesigns the solution. Each cycle increases not only the number of methods known by the student but also the ability to choose among them and modify them intelligently. The mechanism can be represented as follows:

Authentic problem → analysis of context → generation of alternatives → didactic design → testing → evidence and feedback → reflection → redesign

This sequence should not be interpreted as a strictly linear algorithm. In actual teaching, students may return to an earlier stage after new information appears. Its value is analytical: it identifies the professional actions that must be present if cluster cooperation is expected to develop creativity. A school partnership that provides observation but no student design gives limited opportunity for creative action; a project that encourages original ideas but provides no testing or feedback may develop imagination without professional validity. The full cycle connects originality with pedagogical appropriateness.

Table 1. Pedagogical opportunities of the cluster environment and their developmental function

Cluster opportunity	Developmental mechanism	Typical student activity	Expected manifestation of

			didactic creativity
University-school integration	Contact with authentic uncertainty	Analyzing classroom cases; adapting tasks; testing lesson fragments	Context-sensitive variation of methods and tasks
Mentoring and professional dialogue	Exposure to multiple professional perspectives	Comparing alternatives; explaining and defending decisions	Ability to generate and justify several didactic options
Problem-oriented didactic design	Iterative construction and redesign	Creating lesson prototypes; transforming materials; designing assessment	Original but educationally appropriate instructional solutions
Evidence-based reflection	Evaluation and improvement of ideas	Analyzing learner work, errors, participation and feedback	Purposeful revision of didactic decisions
Open innovative environment	Access to distributed human, methodological and digital resources	Selecting and combining resources; interdisciplinary project work	Flexible use of resources without novelty for its own sake

Pedagogical conditions for implementation

The developmental potential described above will not appear automatically whenever institutions are labelled as members of a cluster. Several pedagogical conditions are required. The first is continuity. Creative didactic work should recur across methodology courses, microteaching, practice and project activity. A single “creative lesson” assignment has limited effect if the rest of the curriculum rewards reproduction. Students need repeated cycles of design and revision in progressively more complex situations.

The second condition is the quality of feedback. Feedback should address the relationship between the chosen didactic solution and learner activity rather than only formal lesson-plan compliance. Comments such as “use another method” are less useful than questions and evidence that help the student understand why a particular element should change. Cluster mentors therefore need a shared language for discussing objectives, learner thinking, task design, interaction and assessment.

The third condition is a psychologically safe but intellectually demanding environment. Students should be able to propose an unconventional option without fear that deviation from the mentor’s preferred style will automatically be judged as failure. At the same time, every alternative must be justified. This balance protects creativity from two opposite risks: rigid conformity and uncritical novelty.

The fourth condition concerns assessment. If students are assessed only on whether all formal components of a lesson plan are present, they will optimize their work for compliance. Assessment of didactic creativity should also consider the relevance of the problem analysis, diversity of alternatives, appropriateness of the selected solution, use of evidence, quality of reflection and depth of redesign. Such criteria do not require the evaluator to decide whether an idea is “creative” in an abstract sense; they focus on observable professional actions.

Finally, institutional coordination must support pedagogical goals. University lecturers and school mentors need agreement about what students are expected to learn from practice. When university assignments and school expectations contradict each other, students often respond strategically by satisfying whichever requirement is more immediate. A cluster can reduce this fragmentation if practice tasks, mentoring questions and assessment criteria are jointly designed. In this sense, institutional integration becomes educationally meaningful only when it produces coherence in the student's professional learning experience.

CONCLUSION

The analysis indicates that a pedagogical education cluster can create significant conditions for developing students' didactic creativity, but its effect depends on how institutional cooperation is converted into student activity. The cluster is pedagogically valuable when it gives future teachers regular access to authentic problems, multiple professional perspectives, opportunities for iterative design, evidence about learner response and structured reflection. These conditions allow methodological knowledge to be transformed from a collection of ready-made techniques into a resource for independent professional decision-making.

Five interconnected opportunities were identified: integration of theoretical preparation with authentic practice; mentoring and collaborative professional dialogue; problem-oriented didactic design; evidence-based reflective practice; and participation in an open innovative environment. Together they form a cycle in which the student moves from problem recognition to alternatives, design, testing, feedback, reflection and redesign. This cycle provides a more precise explanation of how a cluster may influence creativity than statements about cooperation or innovation in general.

The theoretical contribution of the article is the operational interpretation of didactic creativity as the capacity to generate, adapt, justify, test and improve pedagogically appropriate solutions. This interpretation makes the construct suitable for subsequent empirical study. Future research may develop diagnostic criteria for the identified components, examine how different forms of mentoring influence students' redesign decisions, and compare the effects of cluster-based practice tasks with conventional lesson-planning assignments. For teacher education institutions, the practical implication is clear: the development of didactic creativity should be built into the architecture of professional preparation rather than added as a separate topic.

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THE ROLE OF PR COMMUNICATIONS IN THE USE OF DIGITAL TECHNOLOGIES IN EDUCATION

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Abstract. *This thesis highlights the role and importance of public relations (PR) communications in the use of digital technologies within the education system. It analyzes the potential of social media, digital content, media relations, partnership communications, and information-sharing mechanisms in crisis situations to help educational institutions build their image in the digital environment, establish effective communication with their audiences, and ensure reliable information exchange. Furthermore, the thesis proposes approaches to strengthening the reputation of educational institutions and fostering long-term relationships with their audiences through the comprehensive organization of digital communications.*

Keywords: *digital technologies, education, PR communications, digital learning environment, social media, media relations, educational institution image, information communications.*

Introduction

The development of digital technologies is fundamentally transforming the methods of information exchange, knowledge delivery, and communication with learners in the education system. E-learning platforms, social media, video content, and interactive communication tools are expanding educational institutions' opportunities to reach wider audiences and provide timely information about educational services. This process plays an important role in enriching traditional forms of education with digital tools, increasing access to educational resources, and taking communication between teachers and learners to a new level.

According to American scholar Richard E. Mayer's theory of multimedia learning, presenting information through a combination of words, images, and other visual elements can positively influence learners' information processing and knowledge acquisition. His approach highlights the importance of purposefully using video lessons, interactive presentations, and visual learning materials in the digital learning environment. However, the effectiveness of such tools depends on their appropriate selection in accordance with educational objectives and the proper organization of learning materials.

UNESCO's 2023 Global Education Monitoring Report considers digital technologies as a means of expanding access to education, delivering knowledge in various formats, and improving the management of educational processes. At the same time, the report emphasizes that the use of technology should be closely aligned with learners' needs, equal opportunities, teachers' preparedness, and educational quality. Therefore, the effectiveness of digitalization is determined not only by the availability of technological tools but also by their rational use for pedagogical and communication purposes.

Another important aspect of digital technologies in education is their potential to develop public relations (PR). In particular, official websites of educational institutions, social media platforms, and electronic information channels make it possible to provide timely and systematic information about the learning process, academic achievements, educational programs, and various events. This increases the significance of PR communications in establishing open dialogue between educational institutions and their audiences, strengthening trust, and building a positive institutional image.

From this perspective, the integration of digital technologies into education is not limited to the modernization of teaching tools. It also requires improvements in the information policies, communication strategies, and public relations practices of educational institutions. The integration of digital learning tools and PR technologies not only ensures the timely, clear, and reliable delivery of information but also helps educational institutions adapt to the modern digital environment.

Under these circumstances, the effective use of digital technologies requires not only the development of technical infrastructure but also the proper organization of communication processes. Public relations (PR) technologies serve as an important tool for building mutual trust between educational institutions and their audiences, communicating institutional achievements, and strengthening a positive institutional image.

The purpose of this thesis is to identify the main areas of PR communications in the process of using digital technologies in education and to substantiate their significance in the activities of educational institutions.

Main Body

The effective organization of digital communications in educational institutions encompasses several interrelated areas that contribute to the development of institutional reputation, the dissemination of information, and the establishment of sustainable relationships with target audiences. The integration of these areas into a comprehensive public relations (PR) strategy enables educational institutions to communicate their activities more effectively, enhance transparency, and strengthen public trust in the digital environment.

First, media relations play an important role in communicating the activities, academic achievements, innovative projects, and educational quality outcomes of educational institutions through mass media. Cooperation with traditional media outlets and digital news platforms enables institutions to reach a wider audience and ensure the dissemination of verified information about their academic and organizational activities. Press releases, interviews with academic staff, expert commentaries, and reports on scientific conferences and educational initiatives can serve as effective instruments for strengthening institutional visibility. Materials based on official information and reliable sources contribute to increasing public awareness of an institution’s activities and achievements. Furthermore, consistent and transparent media relations help educational institutions establish professional relationships with journalists, respond promptly to public inquiries, and maintain their credibility. In this regard, media relations should not be limited to the dissemination of positive information; they should also include timely clarification of controversial issues and the provision of accurate information during crisis situations.

Second, digital content creation enables educational institutions to present the learning process in an accessible, engaging, and informative manner. Educational videos, electronic articles, virtual presentations, infographics, podcasts, and materials highlighting the experiences of students and teachers can meet the information needs of different audience groups while

encouraging knowledge exchange and interest in education. For example, short videos demonstrating teaching methods, interviews with successful graduates, presentations of research findings, and virtual tours of educational facilities can help prospective students and their parents better understand an institution's educational opportunities. In addition, high-quality digital content contributes to the development of a consistent institutional identity and makes complex academic information easier to understand. To achieve these objectives, content should be developed in accordance with the characteristics, interests, and information needs of the intended audience. Particular attention should be paid to the accuracy of the information, the clarity of presentation, visual quality, accessibility, and the regularity of publication. The strategic use of digital content therefore enables educational institutions not only to disseminate information but also to demonstrate their academic values, educational priorities, and institutional achievements.

Third, communication through social media facilitates prompt interaction among educational institutions, teachers, students, and parents. Digital platforms such as Telegram, Instagram, Facebook, and other social networking services provide opportunities to publish announcements, respond to inquiries, collect feedback, and distribute information about educational programs and services. Unlike traditional one-way communication channels, social media supports two-way interaction, allowing institutions to identify audience expectations and adjust their communication strategies accordingly. For instance, online surveys, question-and-answer sessions, live broadcasts, and interactive discussions can be used to assess student satisfaction, clarify admission procedures, and provide information about academic events. These tools also enable educational institutions to identify emerging concerns and address misunderstandings before they develop into more serious reputational problems. However, the effectiveness of social media communication depends on the consistency of publication, the accuracy of information, the timeliness of responses, and the quality of interaction with users. Educational institutions should also establish clear guidelines for managing official accounts, protecting personal data, moderating comments, and responding to misinformation. Consequently, social media should be regarded not merely as a channel for distributing announcements but as a strategic communication environment that supports audience engagement, institutional transparency, and long-term trust.

Fourth, partnership communications contribute to the development of relationships between educational institutions and other educational organizations, research centers, employers, and the wider community. Establishing and maintaining such partnerships is essential for expanding educational opportunities, promoting scientific cooperation, and aligning educational activities with the evolving needs of society and the labor market. Digital platforms provide convenient opportunities to organize joint projects, webinars, online conferences, virtual roundtables, and professional knowledge-sharing events. Through these initiatives, educational institutions can exchange teaching practices, present research findings, develop collaborative educational programs, and establish connections with national and international partners. For example, online meetings between universities and employers can facilitate discussions on professional competencies, internship opportunities, and the practical application of academic knowledge. Similarly, digital cooperation with research institutions can support joint publications, interdisciplinary research, and participation in international academic networks. Effective partnership communications require clearly defined objectives, regular interaction, transparent information exchange, and the identification of mutual benefits. Therefore, digital platforms

should be used not only to establish initial contacts but also to maintain long-term partnerships that contribute to institutional development and academic reputation.

Fifth, digital communication management in crisis situations enables educational institutions to respond promptly to emerging problems, reputational challenges, and the spread of inaccurate or misleading information. In the digital environment, information can circulate rapidly across social networks and online media, potentially affecting public perceptions of an institution before the facts have been fully established. Under such circumstances, official statements, timely updates, factual clarifications, and open communication are essential for maintaining public confidence. Educational institutions should develop clear procedures for identifying potential communication risks, verifying information, coordinating responses among responsible departments, and communicating with affected audiences. For instance, when inaccurate information concerning admission procedures, examination results, institutional decisions, or the quality of educational services begins to circulate, an official response based on verified facts can help prevent misunderstandings and reduce reputational damage. At the same time, crisis communication should not be limited to denying allegations or defending institutional decisions. It should also involve acknowledging confirmed problems, explaining the measures being taken, and providing updates as new information becomes available. The fundamental principles of crisis communication should therefore include accuracy, transparency, timeliness, accountability, and respect for the rights and concerns of stakeholders. A well-developed crisis communication strategy can help educational institutions manage reputational risks and preserve constructive relationships with their audiences.

These areas of digital PR communication are likely to produce more effective results when implemented not independently but within the framework of a unified communication strategy. An integrated approach ensures consistency in the information disseminated through different channels, reduces the risk of contradictory messages, and allows educational institutions to reach diverse audience groups more efficiently. For example, an institution’s academic achievement may initially be announced through an official press release or website publication. Subsequently, the achievement can be presented through video materials and infographics on social media, discussed during online meetings with partner organizations, and shared with relevant media outlets. This coordinated process increases the reach of institutional information, strengthens the visibility of academic achievements, and ensures consistent communication across multiple digital channels. Furthermore, an integrated strategy enables communication specialists to adapt the format and presentation of information to the characteristics of each platform while maintaining a consistent institutional identity.

At the same time, the implementation of digital PR communications presents several challenges that may reduce their effectiveness. These include the dissemination of unverified information, insufficient attention to audience feedback, irregular content publication, limited digital communication skills among responsible employees, and failure to comply with information security requirements. In addition, the absence of a clearly defined communication strategy may lead to fragmented messaging and ineffective use of digital resources. To address these challenges, educational institutions should establish systematic procedures for planning digital communications, assigning responsibilities to relevant staff, studying audience needs, and regularly evaluating communication outcomes. The development of editorial guidelines, fact-checking procedures, data protection measures, and crisis response protocols can further improve the reliability and consistency of digital communication activities.

The effectiveness of digital PR communications should also be assessed using measurable indicators rather than relying solely on the number of publications or social media followers. Relevant indicators may include audience engagement rates, the reach of published materials, response times to inquiries, the number and quality of partnership initiatives, audience satisfaction, and changes in institutional reputation. Regular analysis of these indicators can help institutions identify successful communication practices, address existing weaknesses, and improve their strategies in response to changing audience expectations. Thus, the strategic and systematic application of digital PR technologies can contribute to more transparent institutional communication, stronger stakeholder relationships, and the sustainable development of educational institutions in the digital environment.

In conclusion, digital technologies create extensive opportunities for educational institutions to improve information exchange and develop their public relations. PR communications play a significant role in making effective use of these opportunities, building a positive institutional image, fostering trustworthy relationships with target audiences, and increasing the visibility of educational achievements and institutional activities.

To enhance the effectiveness of digital communications in the education sector, it is advisable to strengthen media relations, develop high-quality digital content, establish two-way communication on social media platforms, expand partnerships, and improve mechanisms for providing timely and transparent information during crisis situations. The comprehensive implementation of these approaches can contribute to more effective communication management, greater institutional transparency, stronger stakeholder relationships, and the sustainable development of educational institutions in the digital environment.

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METHODOLOGICAL ASPECTS OF USING DIGITAL EDUCATIONAL TECHNOLOGIES IN RUSSIAN LANGUAGE LESSONS

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Abstract. *The study examines methodological conditions for integrating digital educational technologies into Russian language lessons. Its aim is to substantiate a structured approach to selecting and applying digital tools for linguistic instruction and formative assessment. The methodological basis includes theoretical analysis and synthesis of pedagogical and methodological literature, comparison of conventional and digital assessment practices, and conceptual modeling of lesson stages. A four-stage framework is proposed: specifying the intended linguistic outcome, selecting relevant language material and learning activity, matching the activity with an appropriate digital tool, and interpreting assessment data to organize corrective and productive follow-up tasks. Examples related to adjective classes and the Kahoot platform illustrate how automated feedback can be combined with independent oral and written language production. The analysis indicates that digital assessment is methodologically useful when quantitative indicators are interpreted qualitatively and linked to subsequent language activity. The proposed framework is a methodological model rather than an experimentally verified intervention; therefore, its effectiveness should be examined in future classroom research.*

Keywords: *digital educational technologies; Russian language teaching; digital linguodidactics; Kahoot; formative assessment; linguistic competence; methodological modeling; feedback.*

INTRODUCTION

The digital transformation of education is changing the organization of learning activities, the forms in which instructional material is presented, and the mechanisms used for pedagogical control [2–5]. In Russian language teaching, these changes are especially significant because a digital environment can combine text, sound, image, interactive action, and prompt feedback within a single learning sequence. Nevertheless, the presence of a digital tool does not in itself produce a pedagogical effect. Its educational value depends on whether the tool is aligned with a clearly defined linguistic outcome, appropriate learning activity, and subsequent interpretation of learner performance.

Contemporary digital linguodidactics treats technology not merely as a technical supplement but as part of the organization of language-learning activity. Recent research on Russian as a foreign language describes the present stage of digital linguodidactics as one of systemic transformation and methodological reconsideration, with increasing attention to teachers' digital competence and the pedagogically justified selection of digital resources [7]. This perspective is directly relevant to school Russian language lessons, where digital tasks must

support concrete operations with linguistic material: recognition, comparison, classification, transformation, explanation, and independent use in speech.

The research problem arises from a discrepancy between the technical capabilities of digital assessment tools and the methodological requirements of language teaching. Rapid scoring, attractive visualization, and a high percentage of correct multiple-choice responses do not necessarily demonstrate that a learner can independently use a grammatical or lexical phenomenon in oral or written discourse. Accordingly, the central question of this study is how digital tools can be integrated into Russian language lessons so that automated practice and feedback contribute to, rather than replace, meaningful language production.

The aim of the study is to identify and theoretically substantiate methodological conditions for using digital educational technologies in Russian language lessons, with particular attention to the alignment of linguistic learning outcomes, digital assessment, and follow-up productive activity. The scientific contribution of the article lies in a conceptually organized four-stage framework that links the selection of a digital tool to the intended linguistic result and requires assessment data to be converted into corrective or productive pedagogical action.

LITERATURE REVIEW AND METHODOLOGY

Digital educational technologies may be understood as software, network, and multimedia resources that support the presentation of educational information, the organization of learner activity, communication, assessment, and analysis of results. Earlier studies of educational informatization emphasized that the central issue is not technical equipment alone, but a transformation in the methods of educational interaction and information processing [3–5]. In language education, this principle means that the pedagogical function of a platform should be derived from the linguistic task rather than the reverse.

Research on game-based response systems provides a useful illustration. Kahoot is frequently associated with increased participation, rapid feedback, and motivational effects, while systematic review evidence also notes recurring limitations such as technical problems, time pressure, and excessive attention to competition or response speed [8]. Therefore, a game-based platform should be used as a means of activating, practicing, or diagnosing knowledge, not as an independent indicator of fully formed language competence. The author’s earlier publications similarly describe both the pedagogical opportunities and constraints of Kahoot in educational practice and in teaching Russian as a foreign language [1, 6].

The concept of formative assessment is particularly important for interpreting digital response data. A recent systematic review of technology-supported formative assessment found that successful practice depends on a clear understanding of the assessment purpose, alignment between the digital tool and pedagogical practice, and the teacher’s ability to interpret data and convert it into instructional action [9]. This conclusion supports the methodological premise adopted in the present study: digital data become educationally meaningful only when they inform explanation, correction, differentiation, or further language production.

The study uses theoretical analysis and synthesis of pedagogical and methodological literature, comparison of conventional and digital forms of assessment, and conceptual modeling of lesson stages. Methodological propositions were derived by relating three components: the intended linguistic outcome, the affordances and limitations of a digital tool, and the type of post-assessment activity required to verify independent language use. Examples from the topic “Adjective” are used to operationalize the model. No new classroom experiment, participant

sample, intervention, or statistical test is reported; consequently, the results are presented as a theoretically substantiated methodological framework rather than as evidence of causal effectiveness.

RESULTS

The analysis shows that digital technologies can perform several interrelated functions in Russian language lessons: informational, instructional, assessment, diagnostic, motivational, and communicative. At the presentation stage, an interactive diagram or electronic table can make linguistic relations more visible. During guided practice, digital exercises allow repeated performance of comparable operations without excessive use of classroom time. During assessment, the system can record responses, response patterns, execution time, and recurrent errors. These functions are valuable only when each is connected to a specific subject outcome.

Morphology and orthography provide especially suitable contexts for this alignment. When studying adjectives, for example, learners may classify adjectives as qualitative, relative, or possessive; identify gender, number, and case; select a normative ending; establish agreement with a noun; or apply an orthographic rule. A digital environment makes it possible to vary the linguistic material rapidly and to build a progression from recognition of a feature to explanation and independent application.

On the basis of the analysis, a four-stage methodological framework is proposed. The framework is designed to prevent the common sequence in which a teacher first chooses a platform and only afterwards decides what learning purpose it should serve. Instead, the intended language result is determined first, and the digital tool is selected only at the third stage.

Table 1. Four-stage framework for integrating digital tools into a Russian language lesson

Stage	Methodological question	Teacher action	Expected evidence
1. Outcome	What linguistic result should be demonstrated?	Specify the target rule, category, operation, or speech skill.	A clearly observable linguistic performance.
2. Activity	What material and learner operation reveal that result?	Select linguistic items and a task type: classify, compare, transform, explain, produce.	Performance connected directly to the target outcome.
3. Digital tool	Which digital function adds methodological value?	Choose a platform for visualization, practice, feedback, recording, or diagnosis.	Timely response data without replacing the learning objective.
4. Interpretation and follow-up	What do the responses mean and what should happen next?	Identify error patterns and organize correction, explanation, differentiation, or productive speech.	Independent oral or written use confirming transfer beyond recognition.

The framework can be operationalized through four diagnostic questions: (1) What linguistic outcome is being assessed? (2) Which error types can the digital task reveal? (3) What additional oral or written task can verify independent language use? (4) How will the teacher use the responses to adjust subsequent instruction? These questions shift attention from platform functionality to the evidence needed for a pedagogical decision.

For example, Kahoot may be used to activate prior knowledge or conduct whole-class formative assessment on adjective classes. After each item, the teacher can immediately see the distribution of responses and identify categories that require clarification. However, a correct selection from predefined options is evidence primarily of recognition. To verify transfer, learners should then justify the classification, edit a sentence, produce their own sentence demonstrating the relevant semantic and grammatical properties, or write a short connected passage. Thus, item-level data are converted into a sequence of diagnosis, explanation, correction, and productive performance.

The same principle applies to orthography. If a digital quiz shows recurrent errors in adjective endings, the teacher can group the errors by grammatical cause rather than merely report the percentage of incorrect answers. The follow-up stage may require learners to explain the governing rule, reconstruct agreement in context, and apply the pattern in a short written task. In this way, digital assessment functions as a source of formative evidence rather than as a substitute for language use.

DISCUSSION

The proposed framework is consistent with the broader shift in digital linguodidactics from isolated use of electronic resources toward systemic pedagogical design [7]. Its distinctive emphasis is the explicit transition from digital response data to subsequent productive language activity. This transition is essential because recognition and selection tasks measure a narrower set of operations than independent sentence or text production. A learner may recognize the correct form when alternatives are provided but still have difficulty retrieving and applying the same form without prompts.

This interpretation also corresponds to findings from research on technology-supported formative assessment. Digital tools can make learner responses visible and provide rapid feedback, but the pedagogical value of these data depends on teachers' ability to interpret them and decide what action should follow [9]. Consequently, teacher digital competence cannot be reduced to knowing how to create a quiz. It includes task design, anticipation of typical linguistic errors, selection of an appropriate point in the lesson for digital activity, interpretation of response patterns, and design of a follow-up task that tests independent performance.

Game mechanics require particular methodological regulation. The motivational and diagnostic potential of Kahoot is well documented, but the literature also records disadvantages connected with technical access, time pressure, competitive ranking, and the possibility that speed becomes more salient than reflection [1, 8]. In a Russian language lesson, this means that response time and leaderboard position should remain secondary to conscious linguistic analysis. When a task requires reasoning, the teacher may deliberately reduce the role of speed, pause after an item for explanation, or transfer the same linguistic phenomenon into a non-competitive productive task.

A blended approach therefore appears methodologically preferable. Digital platforms are especially useful where they add clarity, variability, rapid feedback, and systematic recording of

responses. At the same time, dictation, summary writing, composition, oral response, text editing, and extended work with educational texts remain necessary because they provide evidence that cannot be reduced to multiple-choice performance. The appropriate criterion is not whether a lesson is “digital” or “traditional,” but whether each method generates valid evidence of the intended linguistic outcome.

The study has clear limitations. It does not test the framework with a defined sample of learners and does not compare learning outcomes between instructional conditions. The article also uses the topic of adjectives as an illustrative case rather than validating the model across all sections of the school Russian language curriculum. Therefore, claims are restricted to methodological plausibility and conceptual coherence. Future research should operationalize the framework in classroom settings, define outcome measures in advance, collect both digital process data and independent language-production evidence, and compare changes over time or across instructional conditions.

CONCLUSION

Digital educational technologies expand the methodological repertoire of the Russian language teacher by supporting visualization, repeated practice, rapid feedback, differentiation, and the accumulation of response data. Their effectiveness, however, depends on pedagogical alignment. A digital resource should be selected after the intended linguistic outcome and learning activity have been specified, not before them.

The four-stage framework proposed in this article links (1) the intended linguistic outcome, (2) the relevant language material and learner operation, (3) the digital tool that provides a specific methodological advantage, and (4) interpretation of the resulting data followed by corrective or productive activity. In practical terms, digital assessment should be treated as formative evidence. It should lead to explanation, correction, differentiation, and independent oral or written production, especially when the initial digital task is based on recognition or selection.

The framework may be used as a lesson-design heuristic and as a basis for teacher training in digital pedagogy. Its empirical effectiveness remains to be established. Further studies should test the model across different topics in morphology, syntax, orthography, and text work, using explicit learning outcomes, classroom data, and independent measures of language production.

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CONCEPTUAL APPROACHES TO ENHANCING EDUCATORS' PROFESSIONAL ACTIVITIES THROUGH DIGITAL EDUCATIONAL TECHNOLOGIES

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Abstract. *This article examines the role and significance of digital technologies in the professional development of higher education educators, with particular attention to the transformation of teaching practices, research activities, and continuous professional learning. It explores the essential components of digital competence, including information literacy, effective use of educational software, online communication, digital content creation, and the responsible application of emerging technologies. The discussion highlights how learning management systems, virtual classrooms, collaborative platforms, artificial intelligence tools, and digital assessment methods can support more flexible, interactive, and student-centered educational environments. The article also considers approaches to strengthening educators' digital skills through professional training programs, peer collaboration, self-directed learning, and institutional support. Special emphasis is placed on integrating digital tools into curriculum design, instructional delivery, student feedback, and academic research. In addition, it addresses challenges such as unequal access to technological resources, limited digital literacy, resistance to change, data privacy concerns, and the need for ongoing technical assistance. By analyzing these opportunities and challenges, the article underscores the importance of a systematic approach to digital transformation in higher education. It argues that effective technology integration requires not only access to modern tools but also pedagogical readiness, critical thinking, and continuous evaluation of educational outcomes. Ultimately, the development of digital competence is presented as an essential condition for improving teaching quality, enhancing research productivity, supporting academic collaboration, and preparing educators to meet the evolving demands of contemporary higher education. These considerations offer practical guidance for universities seeking sustainable, inclusive, and evidence-informed professional development strategies.*

Keywords: *digital technologies, Digital competence, Professional development.*

Аннотация. *В статье рассматриваются роль и значение цифровых технологий в профессиональном развитии преподавателей высших учебных заведений с особым вниманием к преобразованию педагогической практики, научно-исследовательской деятельности и непрерывного профессионального обучения. Анализируются основные составляющие цифровой компетентности, включая информационную грамотность, эффективное использование образовательного программного обеспечения, онлайн-коммуникацию, создание цифрового контента и ответственное применение новых технологий. Показано, каким образом системы управления обучением, виртуальные аудитории, платформы совместной работы, инструменты искусственного интеллекта и цифровые методы оценивания способствуют формированию гибкой, интерактивной и ориентированной на студента образовательной среды. Также рассматриваются*

подходы к совершенствованию цифровых навыков преподавателей посредством программ повышения квалификации, профессионального взаимодействия, самостоятельного обучения и институциональной поддержки. Особое внимание уделяется интеграции цифровых инструментов в разработку учебных программ, организацию занятий, предоставление обратной связи студентам и проведение научных исследований. Кроме того, анализируются такие проблемы, как неравный доступ к техническим ресурсам, недостаточный уровень цифровой грамотности, сопротивление изменениям, риски конфиденциальности данных и необходимость постоянной технической поддержки. В частности, подчеркивается значительный практический потенциал цифровых решений для персонализации обучения, повышения доступности учебных материалов, укрепления обратной связи и более эффективного взаимодействия преподавателей со студентами в смешанном формате. На основе анализа существующих возможностей и ограничений обосновывается важность системного подхода к цифровой трансформации высшего образования. Подчеркивается, что успешное внедрение технологий требует не только современных инструментов, но и педагогической готовности, критического мышления, регулярной оценки образовательных результатов. Развитие цифровой компетентности рассматривается как необходимое условие повышения качества преподавания, результативности научной работы, расширения академического сотрудничества и адаптации преподавателей к изменяющимся требованиям современного высшего образования. Представленные положения могут служить практической основой для разработки устойчивых, инклюзивных и научно обоснованных стратегий профессионального развития преподавательского состава университетов.

Ключевые слова: *цифровые технологии, цифровая компетентность, профессиональное развитие.*

Introduction

The rapid transformations currently taking place in the global education system require higher education educators to adopt new approaches and possess a high level of digital literacy. Digital technologies are no longer merely teaching tools; they have become key drivers of the continuous improvement of educators' professional expertise and work productivity. In higher education institutions across the international academic community, research aimed at expanding educators' capacity to organize the educational process effectively through learning management system (LMS) platforms, virtual and augmented reality (VR and AR), digital content creation technologies, electronic monitoring systems, and data-driven education approaches is regarded as a priority area [5, 7].

Research Methodology

This study aims to assess the role of digital technologies in the professional activities of higher education institution (HEI) educators, their levels of digital competence, and the impact of these technologies on educational quality [6,15–17]. Supporting educators' professional development and consistently ensuring the quality of educational outcomes require reorganizing assessment systems on the basis of modern scientific approaches and improving diagnostic methods. Particular importance is attached to developing digital platforms that ensure assessment transparency, objectivity, continuity, and the reliability of results. In particular, implementing multimodal diagnostic approaches that make it possible to monitor and analyze various aspects of educators' activities within a unified information environment is an important factor in educational

quality management. Accordingly, modern educational research recognizes the organization of assessment through the integration of data from multiple sources into a unified diagnostic system as a relevant area of scientific inquiry.

Literature Review

The digitalization of higher education and the development of educators' professional activities through modern technologies have received considerable attention from domestic and international researchers in recent years [6,8]. To identify the theoretical and practical aspects of this issue, it is appropriate to examine the academic literature in three main areas.

Within the international research community, the concept of educators' digital activity is based on the DigCompEdu (Digital Competence Framework for Educators) model. Developed by the European Commission, this framework covers six distinct areas of educators' digital competence, encompassing not only technical skills but also the creation of digital resources, the organization of teaching and learning, assessment, and the development of students' digital skills (Redecker, 2017) [3,5].

Similarly, the TPACK (Technological Pedagogical Content Knowledge) model proposed by Mishra and Koehler (2006) demonstrates that successful teaching practice [4,2] arises from the integrated intersection of three domains of knowledge: technological, pedagogical, and subject-matter knowledge. Contemporary research (Ferrari et al., 2013) indicates that educators who cannot integrate technology with subject-specific teaching methods cannot achieve effective instruction.

Domestic scholars and researchers from Commonwealth of Independent States (CIS) countries pay particular attention to the organizational and pedagogical conditions for introducing digital technologies in higher education:

Domestic research. In Uzbekistan's higher education system, the theoretical foundations for enhancing educators' competence in information and communication technologies (ICT) have been developed in the work of scholars such as A. A. Abduqodirov, U. Sh. Begimqulov, and N. I. Taylaqov. According to these researchers, the digitalization of education should transform the educator's role and elevate the educator to that of an innovator and creator.

Systemic integration. Recent research, including experience with the implementation of HEMIS and LMS systems, has shown that a digital environment can reduce educators' administrative workload and allow them to devote more time to research and creative activities.

An analysis of academic sources indicates that several psychological and technical barriers remain to the practical application of digital technologies.

As Bates (2019) notes in Teaching in a Digital Age, many educators use technology merely to automate traditional teaching practices, such as reading slides instead of writing on the board. Genuine professional development, however, occurs only when teaching practices themselves are transformed through interactivity, blended learning, and project-based instruction.

Analysis and Discussion of Results

The results of the experimental work demonstrated that the use of a multimodal diagnostic approach to evaluating educators' professional activities is more effective than conventional assessment methods. During the study, information relating to educators' professional activities was collected from different sources, integrated, and analyzed within a unified information environment. This increased the objectivity of assessment and enabled regular monitoring of educators' professional development over time. The analysis showed that approaches based solely on tests or expert evaluations cannot fully reflect every aspect of an educator's work. In addition to

improving the reliability of results, the multimodal approach substantially reduced the influence of subjective factors on assessment. Each criterion was characterized by a specific set of indicators, and their combined analysis was used to determine educators' levels of professional development. This approach made it possible to interpret assessment results not merely as final scores, but as analytical information reflecting developmental dynamics. One of the study's important outcomes was confirmation of the practical effectiveness of the author-developed "MuhandislikWeb" information system and its "Muhandislar hisobi" (Engineering Calculations) module. The platform enabled automated collection, processing, and analysis of data on educators' professional activities [7,4]. This is of fundamental importance for improving professional activities.

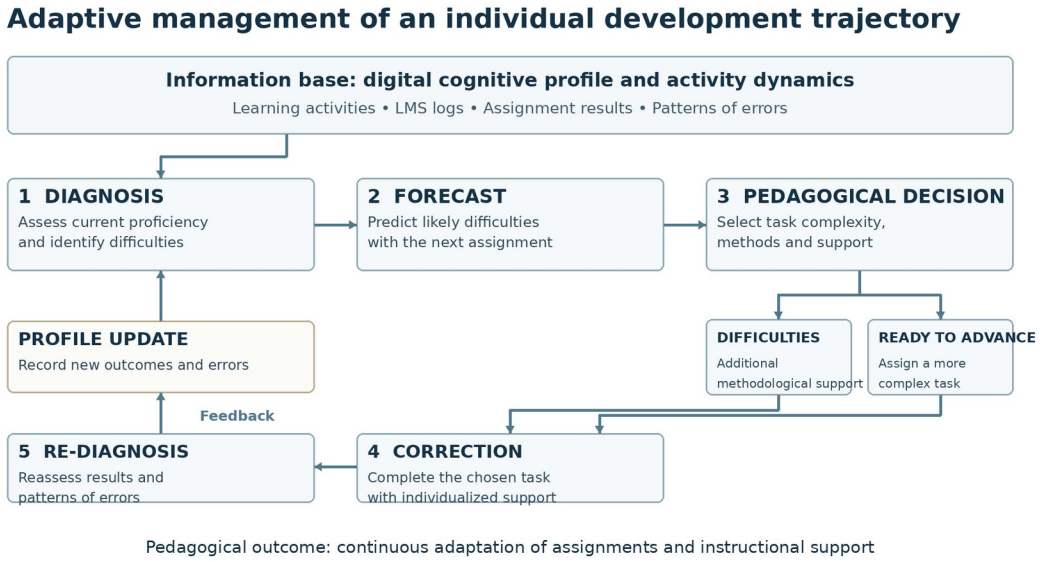
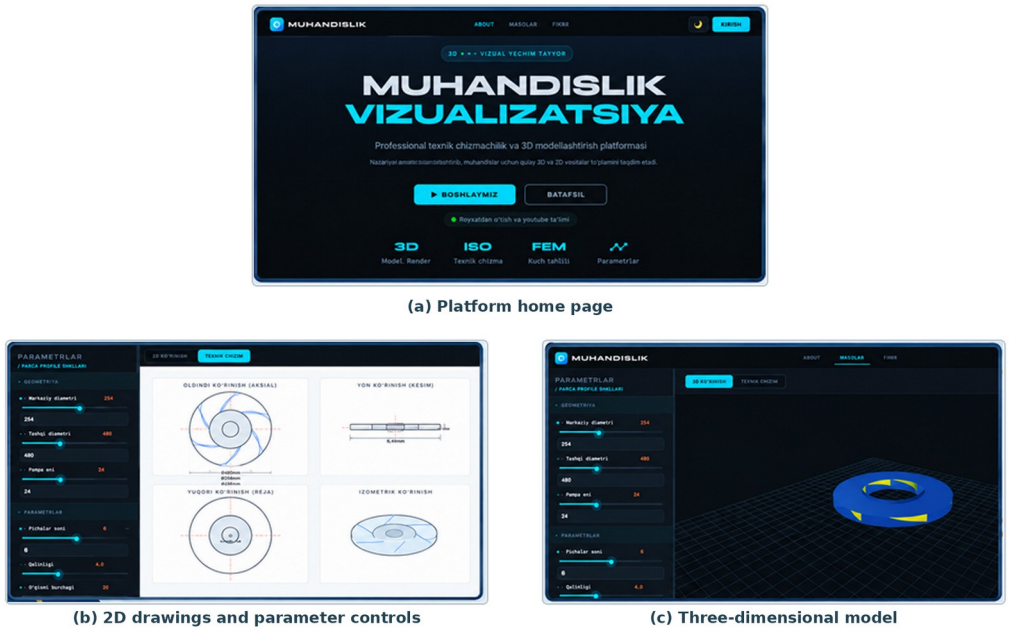


Figure 1. Mechanisms for improving educators' professional activities in a digital technology environment.

In applying this approach in practice, the "Four-Step" method was enhanced with the capabilities of digital education. Its structure is based on the stages of explanation, demonstration, repetition, and independent practice. As a result of this process, educators' methodological and digital competence, capacity for digital instructional design, information and analytical activities, ability to manage digital tools pedagogically, collaborative communication, and reflective development improve progressively (Figure 2).



(a) Platform home page

(b) 2D drawings and parameter controls

(c) Three-dimensional model

Figure 2. Software tool for improving educators' professional activities in a digital technology environment.

Platform URL shown in the source illustration: https://muhandislik2026.netlify.app/

Developing and enhancing educators' individual digital professional activities is an important means of improving their professional competence in modern higher education. This process is not limited to acquiring skills in using digital tools; it also encompasses the ability to plan, organize, manage, analyze, evaluate, and continuously improve one's professional activities in a digital environment. Therefore, the development of individual digital professional activity should proceed in stages, taking into account educators' professional needs, levels of digital preparedness, teaching experience, and readiness for innovation. The process begins with a diagnosis of existing digital competencies. At this stage, educators assess their digital knowledge, skills, and practical experience and identify needs and problems in their professional work. On the basis of the diagnostic results, individual development directions are determined and priority tasks are established for improving the educator's digital professional activities. Digital diagnostics provide an important foundation for understanding personal capabilities and identifying strengths and areas requiring improvement. The next stage involves designing teaching activities within a digital environment.

The informatization of education is one of the main factors driving its improvement. An important means of achieving this is for teaching staff to develop interactive textbooks, electronic teaching and methodological packages, or websites for the subjects they teach. These resources serve as key components in creating a digital learning environment for each subject and help solve engineering problems more easily and effectively [8,1].

Conclusions and Recommendations

This study undertook a comprehensive analysis of the role of digital technologies in the professional activities of higher education institution (HEI) educators and their impact on professional development. On the basis of the findings and theoretical analysis, the following main scientific conclusions were drawn [1,3]:

1. Transformation of professional activity. Digital technologies are changing the role of higher education educators from traditional "knowledge providers" (lecturers) to "learning facilitators and facilitator-creators." In addition to technical skills, this requires educators to develop digital pedagogical expertise in accordance with the TPACK and DigCompEdu models.

2. Optimization of time and labor resources. Integrating learning management systems (HEMIS and Moodle) and artificial intelligence (AI) tools into the educational process can reduce educators' administrative and routine work by 30–40%, enabling them to focus more on research and creative activities.

3. Existing barriers. The main obstacles to educators' professional development appear to be psychological resistance (anxiety about adapting to digital technologies) and insufficient methodological support and systematic training, rather than technical infrastructure problems.

Based on the research findings, recommendations for improving the effectiveness of digital technology use in higher education educators' professional activities were grouped into three main areas:

Implement a digital competence assessment system. Periodically assess HEI educators' digital skills against DigCompEdu standards and incorporate the results into a rating system.

Establish incentive mechanisms. Introduce financial and non-financial incentives for educators who create high-quality digital learning resources and interactive video lectures and make effective use of AI platforms.

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FROM CULTURAL SOURCES TO CLASSROOM JUDGEMENT: DEVELOPING PROSPECTIVE TEACHERS' PROFESSIONAL CULTURAL STUDIES COMPETENCE

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Abstract. *Preparing teachers to work thoughtfully with cultural differences requires more than familiarity with traditions and historical facts. This article considers how teacher education can turn cultural study into informed classroom judgment. It describes a teaching approach that brings together source interpretation, comparison across cultural settings, discussion, case analysis, project design, and reflection. Historical writing, literature, symbols, local customs, and heritage sites provide material through which students examine the educational meanings of cultural practices. Comparing different accounts of teaching and upbringing helps them avoid treating one cultural viewpoint as universal. Classroom dilemmas then ask students to weigh family expectations, institutional responsibilities, and the perspectives of those involved before choosing a response. The article proposes a sequence of tasks moving from source reading and contextual analysis to the preparation of lessons and educational activities. Assessment focuses on what students can explain, justify, and produce, using case responses, reflective writing, portfolios, and teaching materials. An example drawn from Abdulla Avloniy's work shows how a historical discussion of moral conduct can inform present-day teacher responsibilities. It also treats cultural disagreement as a normal teaching concern. The central argument is that cultural understanding develops as students interpret evidence, question assumptions, and make defensible pedagogical choices.*

Keywords: *prospective teachers, cultural studies competence, cultural source analysis, teacher education, pedagogical dialogue, reflective assessment*

Introduction

For prospective teachers, knowing about cultural traditions is not the same as knowing how to teach with them. The distinction matters when a historical text, a family custom, or a local monument enters the classroom. Students must be able to read such material in context, consider whose values it expresses, and decide whether it can serve a worthwhile educational purpose. Methodological support, as discussed here, refers to the materials and teaching arrangements that make this work possible: carefully chosen sources, interpretive and comparative tasks, classroom dilemmas, discussion, project work, opportunities for reflection, and means of assessing student responses. These elements belong together because each addresses a different part of the movement from cultural knowledge to teaching judgment. Reading a source begins with its historical and social circumstances. Students then ask what the source says about human relationships, conduct, or education and how those ideas might be presented responsibly to today's learners. Historical documents, the writings of thinkers, fiction, symbols, customs, and inherited practices can all be examined in this way. The task is not simply to name a tradition or reproduce its account; students need to explain their reading and identify a possible educational use. Comparison makes this interpretive work more demanding. Students might consider the qualities expected of

teachers in Eastern and Western educational thought, or examine how different communities understand upbringing. Such comparisons should attend to the time and circumstances in which particular ideas arose. Otherwise, differences are easily reduced to fixed cultural labels rather than examined as historical and social questions.

Cultural-pedagogical cases provide a setting in which these interpretations must be put to use. A case may concern a disagreement between family expectations and school requirements, or a situation in which the participants attach different meanings to the same custom. Rather than asking for an immediate answer, the teacher can require students to identify the cultural assumptions at work, hear each participant's position, consider possible responses, and explain the grounds for their preferred action. Cultural attentiveness thus becomes part of professional judgment rather than an abstract personal quality. Project assignments extend the work beyond discussion. Students can use cultural material to prepare part of a lesson, plan an educational event, write a case for classroom use, design an excursion, or devise a creative task. A museum collection, historical site, neighborhood tradition, digitized archive, or virtual exhibition may serve as the starting point. What matters is what students do with the material: they select it, interpret it, and shape it for a particular group of learners and a stated teaching purpose.

Assignments should become more demanding as students gain experience. Early tasks may ask them to recognize and describe a cultural practice. Later tasks require an account of its historical setting, a comparison with another practice, and an interpretation of the values at issue. The final step is to make something usable for teaching and defend the choices behind it. Assessment needs to follow the same path. A test of terms and dates can establish factual knowledge, but it cannot show whether a student can handle a sensitive classroom situation or prepare a sound activity from a cultural source. Written case decisions, reflective essays, portfolios, project work, and student-produced lesson materials offer a closer view of that capacity. Table 1 connects these teaching methods with examples of the work students might submit.

Table 1

Teaching Activities and Evidence of Professional Cultural Studies Competence

Instructional approach	Example student task	What the work makes visible
Reading cultural sources	Explain a passage in its historical setting and identify a teaching question.	An interpretation supported by textual or contextual evidence.
Comparing cultural accounts	Examine accounts of teaching or upbringing from different settings.	Attention to context, differences, and points of agreement.
Discussing classroom dilemmas	Consider family, pupil, and school perspectives before choosing a response.	A decision with reasons and awareness of competing concerns.
Structured dialogue	Present a reading, answer objections, and reconsider an initial claim.	Listening, use of evidence, and willingness to revise a view.
Designing a teaching activity	Plan a lesson segment, heritage task, or educational excursion.	A feasible activity with a stated educational purpose.
Reflective portfolio	Collect case responses, teaching	A documented account of how

Instructional approach	Example student task	What the work makes visible
	materials, and notes on revised choices.	cultural learning informs practice.

Note. The activities and forms of evidence are drawn from the methodological discussion in this article; they are not results from an empirical assessment.

How Pedagogical Interaction Shapes Cultural Judgement

Cultural understanding is also formed in conversation. Teacher–student exchanges, discussion among peers, joint readings of sources, and shared responses to classroom dilemmas allow students to test an interpretation against other experiences. In this article, pedagogical interaction means purposeful work among participants who are trying to understand a cultural issue and relate it to the responsibilities of teaching. Its value lies not in discussion for its own sake, but in the opportunity to make assumptions visible, examine reasons, and reconsider an initial response.

An explanation supplied by the lecturer can give students information about a custom or historical event. It does not, by itself, tell them how that information should shape their work as teachers. They must ask what a source means in its setting, what it leaves uncertain, and why their own reading is justified. A well-placed question, a competing interpretation from a classmate, or a disagreement over a case can prompt precisely this work. The students arrive with different experiences: family practices, regional histories, languages of everyday life, and social expectations all influence what they notice. Those differences should be treated as material for careful inquiry, not as obstacles to be smoothed over. When students explain how they have understood a practice and listen to other accounts, they can recognize common concerns without assuming that everyone attaches the same meaning to them. The result sought is a more considered professional position, not the elimination of disagreement.

The discussion can begin with familiar terms—culture, heritage, cultural identity, value, tradition, and cultural environment—but it should not end with definitions. Students might be asked where cultural identity appears in a school event, how a local custom is represented in a textbook, or which values are implied by a classroom rule. Such questions give theoretical language a specific object. They also require students to distinguish what they have observed from the interpretation they place upon it.

Questions of value require particular care. Cultural inheritance, national commitments, widely shared human values, dignity, social responsibility, and mutual respect cannot be taught adequately as a list of approved attitudes. Students need opportunities to consider what those commitments demand when people disagree. A literary episode, the actions of a historical figure, a conflict over a school practice, or a difficult teaching decision may give a discussion enough substance to move beyond general statements. As students defend and revise their views, their positions on cultural and ethical matters can become more deliberate. Those positions will later influence how they address pupils, communicate with families, and respond to disagreements.

Interpretive dialogue asks a group to work out what a cultural text or practice might mean. The lecturer's role is to frame the problem, request evidence, and keep alternative readings open long enough for them to be examined. When students study a historical account, a poem, a symbol, a tradition, or a pedagogical argument, they should identify not only their preferred interpretation

but also the grounds on which a different reading might rest. They then consider what, if anything, the source offers to contemporary education. This manner of discussion teaches students to justify a claim without pretending that a complex cultural question has only one possible answer.

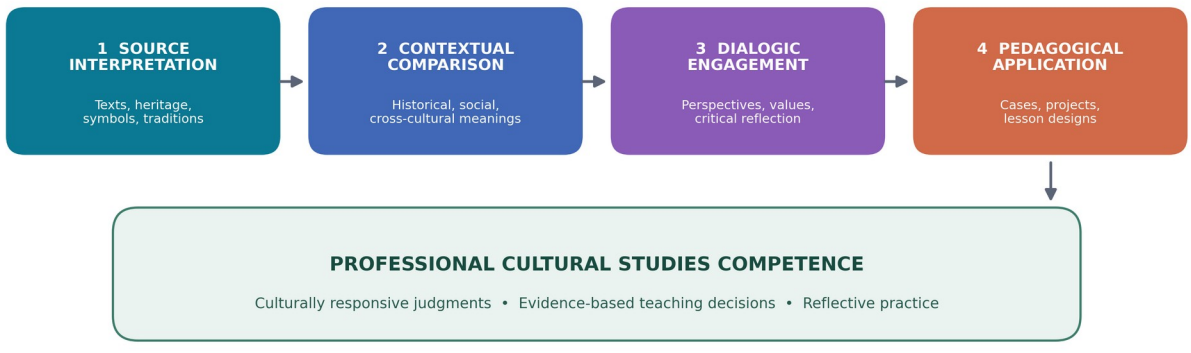
Joint work on an educational product introduces another demand: decisions must be negotiated. A group preparing a heritage-based lesson or resolving a cultural-pedagogical case has to assign responsibilities, reconcile competing proposals, and explain its final design. The same holds for a class that plans an excursion or develops a school event around a historical site. Students cannot rely on a general appreciation of culture; they must decide which materials are suitable, what pupils will be asked to do, and how the activity will be judged. The practical task gives cultural study a definite professional setting.

Dialogue deserves emphasis because it can expose the limits of an apparently self-evident judgment. A student may take a family's practice for granted until a peer describes another way of organising the same aspect of life. Listening does not oblige anyone to accept every interpretation. It does require participants to understand a view before answering it, to give reasons for their response, and to consider the circumstances behind a disagreement. These habits matter for teachers who will work with pupils and families whose experiences differ from their own.

Several educational purposes meet in such exchanges. Students practice reading cultural material closely, comparing explanations, speaking across differences, and making decisions in situations that resemble school life. A simulated dispute about an event, for example, requires them to decide which facts are relevant, which participants should be heard, and what response a teacher can reasonably defend. The work ties cultural knowledge to a course of action without treating the two as interchangeable. It also makes the varied backgrounds within a teacher-education group useful for learning. When students hear an unfamiliar account of a custom, they may recognize a stereotype in their own explanation or discover a question they had not considered. These are small but consequential exercises in preparing to teach children from different social and cultural circumstances. They show why the quality of interaction matters as much as the quantity of cultural material covered.

Figure 1

From Reading Cultural Sources to Making Classroom Decisions



Note. The diagram presents a teaching sequence proposed in the article, not measured stages or empirical findings.

Working With Cultural Sources in Teacher-Education Classes

Choose methods by what they ask students to do, not by name alone. In teacher education, students need to interpret cultural evidence, situate customs historically, consider national and broader human values, and justify educational decisions. Reading sources, comparing traditions, discussing classroom cases, and designing projects each offer a different way to practice those tasks. Their worth rests on the questions asked and the evidence students must provide.

Source analysis starts with a question about a document, text, object, or practice. Materials might include Eastern scholars' writings, the legacy of Jadid educational reformers, oral traditions, archival records, literature, monuments, and present-day culture. Students identify what a source says, establish its historical circumstances, and locate an educational idea worth examining. They then explain how that idea speaks to a contemporary teaching problem. Retelling the source is a first step, not a finished analysis; its historical context must remain visible when the material is adapted for school use.

Close reading requires students to separate central claims from incidental detail, consider the author's position and intended audience, and identify the assumptions behind a statement. They then frame a pedagogical question rather than treating a historical passage as a ready-made lesson. Comparing two sources on the same issue can sharpen this inquiry: differences require explanation, and claims must be supported by the available evidence.

This approach is useful when a class begins with an unexamined assumption. Consider a proposed school event on national values: the organizers have collected historical material, but their plan asks pupils only to listen. Prospective teachers can revisit the sources, distinguish information from an educational task, and decide what each item could help pupils understand. The difficulty is not a shortage of facts. It is the absence of opportunities for pupils to examine what those facts mean. This exercise fits naturally into a course on pedagogical theory.

Classroom Example: Reading Abdulla Avloniy

In a class on the values underlying pedagogical work, students might read a short passage from Abdulla Avloniy's *Turkiy guliston yoxud axloq* (*Turkic Rose Garden, or Morality*) on knowledge, conduct, teaching, or upbringing. First, they identify the value the passage emphasizes and explain how the author presents it. Next, they ask what a contemporary teacher would do to demonstrate that value. Responsibility, intellectual seriousness, and ethical example might lead to different classroom actions. Students finish by linking a claim in Avloniy's writing to a current professional expectation and a specific teacher action. The text becomes material for pedagogical judgment, not a historical fact to memorize.

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DIDACTIC OPPORTUNITIES OF DIGITAL TECHNOLOGIES FOR DEVELOPING STUDENTS' PROGRAMMING COMPETENCE

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Abstract. Programming competence is a key outcome of computing and engineering education, yet many students struggle with abstraction, debugging and transfer to authentic projects. This study examines how digital technologies can be used didactically to develop that competence. An analytical synthesis of the international literature and design-based reasoning were used to specify programming competence as a three-component construct (knowledge, skills, dispositions), to classify seven families of digital technologies by didactic function, and to build a three-layer didactic model. The model is operationalised through an iterative learning cycle, a graphical user interface (GUI) prototype, an assessment rubric and an implementation roadmap. The results indicate that technologies develop programming competence when they make program execution visible, provide scaffolded formative feedback, simulate professional practice and are guided by teachers with adequate technological pedagogical content knowledge. The model can be validated in future quasi-experimental studies.

Keywords*:* programming competence; digital technologies; didactics; computational thinking; automated assessment; program visualisation; learning environment; higher education.

Аннотация. Компетентность в области программирования является ключевым результатом образования в сфере вычислительной техники и инженерии, однако многие студенты испытывают трудности с абстрагированием, отладкой и переносом знаний в реальные проекты. В данном исследовании рассматривается, как цифровые технологии можно использовать дидактически для развития этой компетентности. С помощью аналитического синтеза международной литературы и проектно-ориентированного обоснования программистская компетентность была определена как трёхкомпонентный конструкт (знания, умения, личностные установки), семь групп цифровых технологий были классифицированы по дидактическим функциям, а также построена трёхуровневая дидактическая модель. Модель реализуется через итеративный учебный цикл, прототип графического пользовательского интерфейса (GUI), рубрику оценивания и дорожную карту внедрения. Результаты показывают, что технологии развивают компетентность в области программирования тогда, когда они делают выполнение программы наглядным, обеспечивают поэтапную (скаффолдинговую) формирующую обратную связь, имитируют профессиональную практику и применяются преподавателями, обладающими достаточными технолого-педагогическими предметными знаниями (TPACK). Модель может быть проверена в будущих квазиэкспериментальных исследованиях.

***Ключевые слова*:** программистская компетентность; цифровые технологии; дидактика; вычислительное мышление; автоматизированное оценивание; визуализация программ; учебная среда; высшее образование.

1. Introduction

Software has become basic infrastructure of modern economies, and the ability to design, write and maintain programs is a strategic educational goal. In Uzbekistan, the Digital Uzbekistan–2030 strategy has increased the demand for graduates who can program reliably and work in teams [1]. Universities are therefore expected to develop a durable programming competence: an integrated ability to analyse problems, design algorithms, implement and test solutions, and reflect on their quality.

Learning to program is cognitively demanding. Novices must master syntax, build correct mental models of program execution and apply problem-solving strategies at the same time [2, 3]. Traditional lecture-and-laboratory formats give limited individual feedback, hide the behaviour of programs from the learner and often assess only the final product. Cloud environments, visualisation tools, automated graders, learning platforms, version-control systems and generative artificial intelligence (AI) offer new didactic opportunities to address these weaknesses [4].

Technology does not teach by itself. Learning gains appear only when tools are aligned with learning objectives, scaffolded by the teacher and integrated into assessment [5, 6]. In practice, tools are often adopted opportunistically, and studies usually evaluate a single tool in isolation. A framework that explains which technology supports which component of programming competence, and through which mechanism, is still lacking.

The aim of this study is to develop such a framework. It addresses three questions: (1) how can programming competence be structured so that it can be developed and assessed with digital technologies; (2) what didactic functions do the main families of technologies perform; and (3) how can these technologies be combined into a coherent model, interface and assessment system for university courses?

2. Methods

The study is conceptual and design-oriented. It combines an analytical synthesis of the literature on programming education with design-based reasoning and followed four stages: (1) specification of the competence construct; (2) classification of tools by the didactic function they perform rather than by product; (3) mapping of relationships between tool functions, didactic mechanisms and competence components into a layered model; and (4) design of a GUI prototype, an assessment rubric and an implementation plan. No new empirical data were collected; the model is therefore a set of evidence-informed design propositions.

Programming competence is defined as the integrated, context-dependent ability to mobilise knowledge, skills and dispositions in order to develop correct, readable and maintainable software. The definition draws on the revised taxonomy of educational objectives [7] and on computational thinking, which includes decomposition, abstraction, pattern recognition and algorithm design [8, 9]. The operational structure is shown in Table 1.

Table 1. Structure of programming competence (author’s synthesis)

Component	Description	Observable indicators
Knowledge	Syntax and semantics of a language; data structures; algorithmic paradigms; the notional machine of program execution [10]	Explains what a code fragment does; predicts output; selects an appropriate data structure

Component	Description	Observable indicators
Skills	Problem decomposition, coding, testing, debugging, refactoring, version control, documentation	Produces working solutions; writes unit tests; locates and fixes defects systematically
Dispositions	Persistence, self-regulation, collaboration, academic integrity, responsible use of tools including AI	Seeks help appropriately; reflects on errors; discloses tool and AI assistance

The didactic design rests on four theoretical foundations. Constructionism holds that learners build knowledge most effectively while creating shareable artefacts such as programs [11]. Cognitive load theory explains why novices need worked examples, reduced extraneous load and gradually faded support [12]. The zone of proximal development justifies adaptive hints and peer collaboration as scaffolds [13]. Research on feedback shows that its effect depends on whether it tells the learner where they are going, how they are doing and what to do next [6]. From these foundations four design principles were derived: make execution visible, give timely and informative feedback, adjust difficulty and support, and keep learners active as creators.

3. Results

The analysis identified seven families of digital technologies with distinct didactic functions. Table 2 links each family to the components of programming competence.

Table 2. Families of digital technologies, didactic functions and targeted competence components

Technology family	Examples	Main didactic function	Competence component	Key condition
Cloud IDEs and notebooks	Browser-based editors; Jupyter-type notebooks	Removes installation barriers; enables instant practice and sharing of runnable examples	Skills	Stable access; templates
Program visualisation	Step-through debuggers; memory-model visualisers	Makes the notional machine visible; supports predict–observe–explain tasks [10, 14, 15]	Knowledge	Active tasks, not passive viewing
Automated assessment	Unit-test graders; style checkers; online judges	Gives immediate, repeatable feedback; frees teacher time for qualitative feedback [16]	Skills; knowledge	Meaningful tests; formative use
Learning platforms and analytics	LMS; MOOCs; adaptive practice; dashboards	Structures the course path; records progress; supports flipped learning [17]	Dispositions; knowledge	Clear learning outcomes

Technology family	Examples	Main didactic function	Competence component	Key condition
Gamified and block-based tools	Block-based languages; badges and levels	Lowers entry barriers; sustains motivation [18, 19, 21]	Dispositions	Avoid extrinsic over-reliance
Collaboration and version control	Git platforms; shared editors; code review	Simulates professional workflows; develops teamwork and review habits [20]	Skills; dispositions	Roles and review rules
Generative AI assistants	Code explainers; conversational tutors	Offers personalised explanations and debugging dialogue [22–24]	Knowledge; dispositions	Hint-only policy; integrity rules

Cloud IDEs remove configuration problems that consume the first weeks of many courses, so students can start coding within minutes on any device. This increases time on task, which is didactically significant because programming skill develops mainly through deliberate practice with feedback.

Novices often cannot observe what the computer does with their code and therefore form incomplete mental models [3, 10]. Visualisation tools externalise variables, call stacks and references at each step [14]. Their value, however, depends on task design: effectiveness is higher when learners are actively engaged, for example by predicting the next step, than when they merely watch an animation [15]. A recommended sequence is predict, run and observe, explain the difference, and modify the code.

Automated assessment systems run test suites and may check style and complexity. When used formatively, with unlimited submissions, informative messages and mastery-based grading, they shorten the debugging cycle [16]. They cannot judge design quality or readability reliably, so teachers should add human feedback on these aspects. Learning platforms additionally record attempts, time on task and error types, which lets instructors identify difficult concepts and at-risk students; a flipped design uses class time for problem-solving instead of exposition [17].

Gamified elements such as progress bars and badges can strengthen engagement when they signal competence rather than reward mere activity [18, 19]. Collaboration tools provide authentic practice through pair programming, code review and version-controlled projects [20], while block-based environments lower the entry barrier for beginners [21].

Generative AI can explain error messages, propose alternative solutions and generate practice questions, but it can also bypass the productive struggle needed for learning and weaken the validity of take-home assignments [22, 23, 24]. A sound policy positions the assistant as a hint provider rather than a solution generator, requires students to document their use of it, gives more weight to process-based and oral assessment, and teaches critical evaluation of generated code.

To integrate these families, a three-layer model is proposed (Figure 1). Layer A contains the technologies, Layer B the didactic mechanisms through which they act on learners, and Layer C the competence outcomes. Technology selection should start from the intended outcome and the required mechanism, not from the available tool.

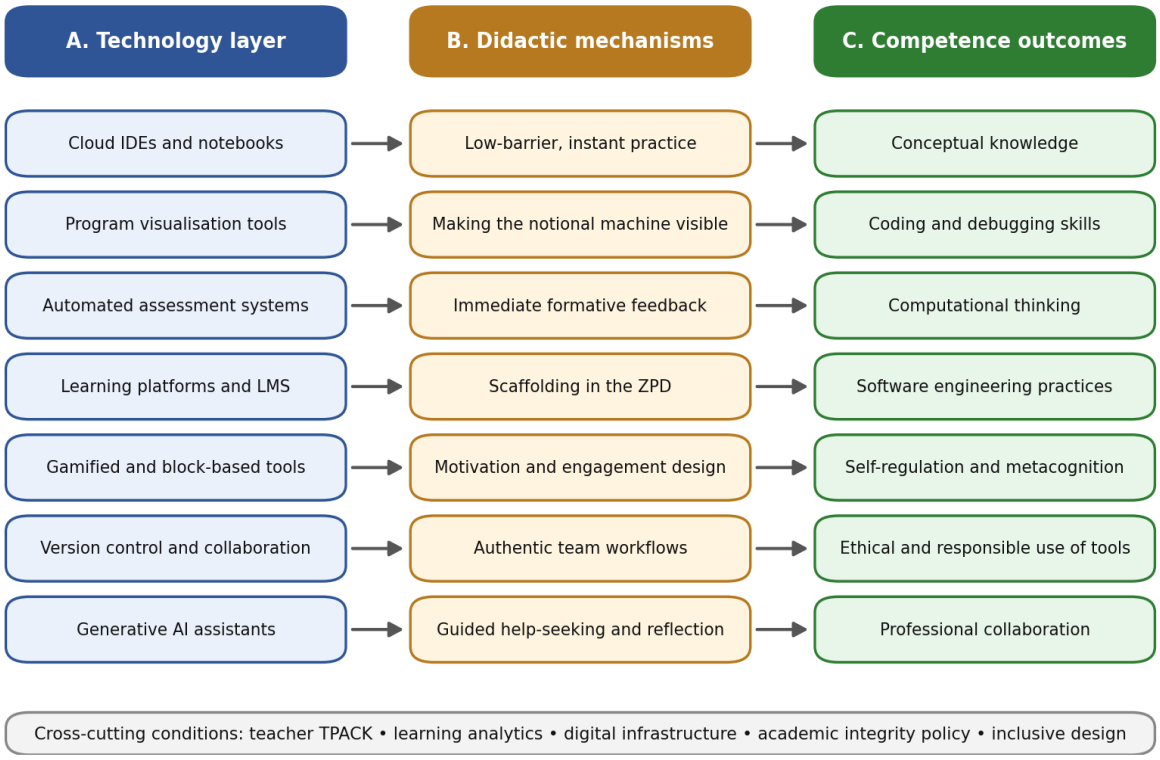


Figure 1. Three-layer didactic model linking digital technologies, didactic mechanisms and programming competence outcomes (author's development)

At course level the model is realised through an iterative cycle of six phases: planning, coding, testing, visualisation and debugging, feedback, and reflection (Figure 2). Each phase is supported by specific tools, and each pass generates data on the learner's progress.

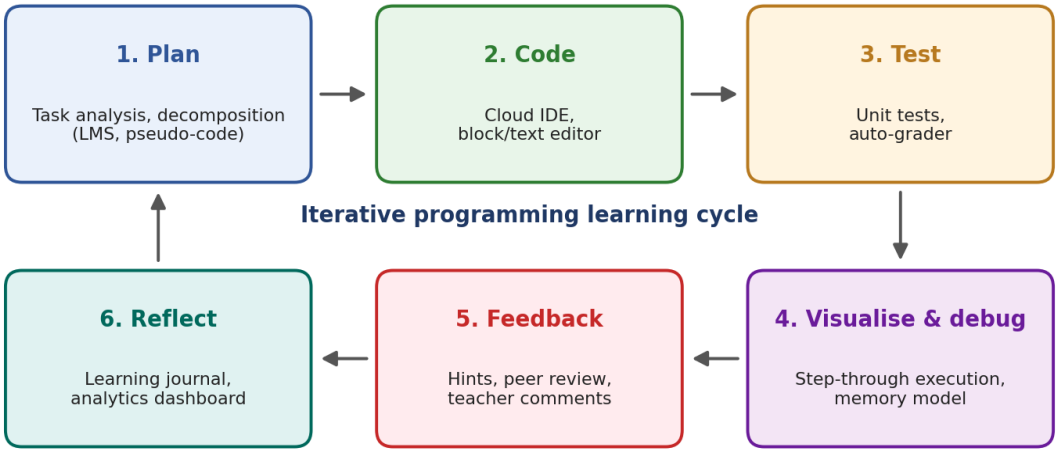


Figure 2. Iterative programming learning cycle supported by digital technologies

The user interface strongly influences cognitive load and engagement. The proposed GUI (Figure 3) follows a "one screen, one task" principle with five coordinated zones: a course map with mastery indicators, a task panel, a code editor with Run and Check controls, an automated test panel, and a visual execution panel with a learning assistant. Keeping the problem, code, results and explanation visible at once reduces split attention and extraneous load [12]. The assistant offers graded hints and never the complete solution; all hint requests, test runs and submissions are

logged for analytics and academic integrity. Table 3 relates the interface components to their didactic purpose.

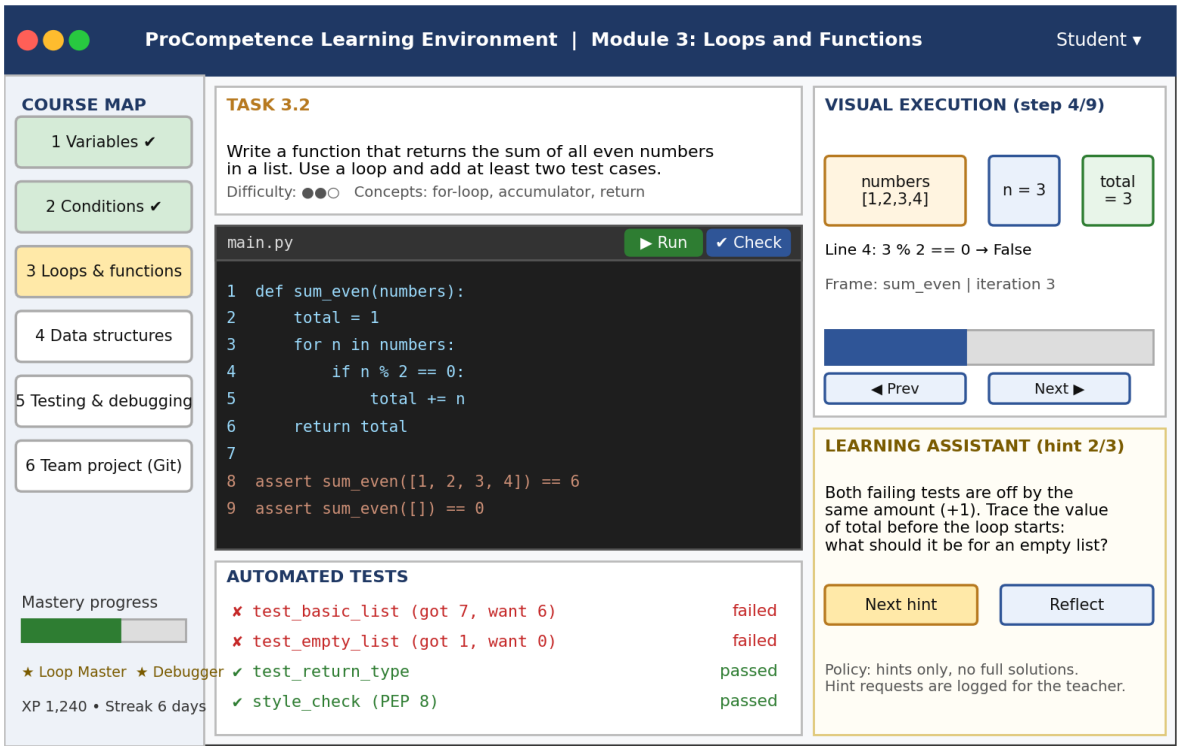


Figure 3. GUI prototype (wireframe) of the integrated programming learning environment

Table 3. Interface components and their didactic purpose

GUI component	Function	Didactic principle / competence component
Course map	Shows modules, completion status and mastery level	Learner control; self-regulation (dispositions)
Task panel	States goal, difficulty and concepts; links to worked examples	Goal clarity; reduced cognitive load (knowledge)
Code editor with Run/Check	Writing, executing and submitting code in one place	Constructionism; deliberate practice (skills)
Automated test panel	Lists test cases, expected versus actual output, style warnings	Immediate formative feedback (skills, knowledge)
Visual execution panel	Step-by-step display of variables, frames and control flow	Notional-machine visibility; prediction tasks (knowledge)
Learning assistant	Graded hints, error explanations, reflection prompts	Scaffolding in the ZPD; guided help-seeking (dispositions)
Progress and badges	Mastery progress, streaks and achievements	Motivation; competence feedback (dispositions)

Assessment must reflect the integrated nature of competence and the availability of powerful tools. A balanced system combines formative assessment through automated tests and

peer review, summative practical assessment under controlled conditions, process evidence from version-control histories and learning logs, and oral defence of submitted work. Table 4 presents an analytic rubric with four performance levels.

Table 4. Analytic rubric for assessing programming competence

Criterion	Level 1: Beginning	Level 2: Developing	Level 3: Proficient	Level 4: Advanced
Problem analysis and decomposition	Restates the task; no decomposition	Identifies main parts; incomplete requirements	Clear decomposition into functions/modules	Justified design alternatives; anticipates edge cases
Correctness and functionality	Does not run or passes few tests	Passes basic tests only	Passes all specified tests including edge cases	Robust; handles invalid input; efficient
Testing and debugging	Trial and error	Print statements; few tests	Unit tests; systematic use of debugger	Test-driven; explains root causes
Code quality and documentation	Unreadable; no comments	Partly readable; inconsistent naming	Follows style guide; meaningful names	Refactored, modular; fully documented
Collaboration and version control	No version history	Few large commits	Regular, meaningful commits; takes part in reviews	Constructive reviews; manages branches and issues
Reflection and responsible tool use	No reflection; undisclosed tool use	Descriptive reflection; partial disclosure	Analytical reflection; transparent AI use	Critical evaluation of tools; improvement plan

Implementation requires a phased approach that combines infrastructure, teacher development and curriculum redesign (Table 5). For a single course the roadmap can be completed within two academic semesters and then scaled to a whole programme.

Table 5. Phased roadmap for implementing the didactic model

Phase	Duration	Main activities	Outputs / indicators
1. Analysis	2–4 weeks	Audit of infrastructure and tools; diagnostic test of prior knowledge; target competences	Needs report; baseline data
2. Design	4–6 weeks	Tool selection by function (Table 2); design of tasks, tests, hint levels and rubric; teacher training and AI-use policy	Course blueprint; task bank; trained instructors

Phase	Duration	Main activities	Outputs / indicators
3. Pilot	One semester	Delivery in one or two groups; weekly analytics review; collection of feedback	Usage logs; satisfaction survey
4. Evaluation and scaling	One semester	Comparison with a control group; revision of materials; dissemination	Effect-size estimates; revised model

4. Discussion

The results shift the view of technology from a delivery medium to a didactic instrument that shapes learning activities. Three insights emerge. First, alignment matters more than novelty: each tool should be chosen for the mechanism it activates, such as visualisation for mental-model building and automated tests for feedback. Second, feedback and visibility are the central levers; the strongest evidence concerns timely feedback and observable program behaviour, whereas the benefits of purely motivational add-ons are more context-dependent [16, 19]. Third, teachers remain decisive: automated tools do not replace human judgement on design quality, and the AI era makes assessment designs that capture real understanding even more important [5, 25].

The model is relevant to the Uzbek higher-education context. Cloud-based environments can compensate for unequal hardware availability, open-source tools reduce licence costs, and tasks and hints in Uzbek, Russian and English can lower language barriers. Project tasks drawn from local e-government and industry contexts would link the courses to national digital-skills priorities [1]. Table 6 summarises the principal risks and mitigation strategies.

Table 6. Principal risks and recommended mitigation strategies

Risk	Possible consequence	Mitigation strategy
Tool-centred adoption	Fragmented practice; no gain in competence	Start from learning outcomes; use the technology–mechanism–outcome mapping
Over-reliance on automated tests	Students code to the tests and neglect design	Hidden test cases; rubric-based human review
Misuse of generative AI	Superficial learning; invalid assessment	Hint-only policy; process evidence; oral defence; AI-use declarations
Digital divide	Unequal access to devices and connectivity	Lightweight browser-based tools; campus access points
Insufficient teacher preparation	Superficial or inconsistent use of tools	TPACK-oriented training; peer mentoring; shared task repositories
Privacy and data protection	Misuse of learner logs	Data minimisation; informed consent; data-governance policy

The main limitation is that the study is conceptual: it contains no new empirical data, the literature was not collected through a protocol-driven systematic review, and the classification will need updating as tools evolve, particularly generative AI. Future research should test the model in a quasi-experimental pre-test/post-test design with an experimental group using the integrated

environment and a control group in traditional laboratories. Knowledge and skills can be compared by ANCOVA with the pre-test as covariate and by rubric-based practical examinations (Table 4), while platform logs, questionnaires and interviews can capture engagement, motivation and perceptions. Long-term retention, transfer and equity effects also deserve study.

5. Conclusion

Programming competence was structured into knowledge, skills and dispositions, seven families of digital technologies were classified by didactic function, and a three-layer model with an iterative learning cycle, a GUI prototype, an assessment rubric and an implementation roadmap was proposed. Digital technologies develop programming competence when they make program execution visible, provide timely formative feedback, scaffold learners within their zone of proximal development, simulate authentic professional practice and are guided by teachers who combine technological, pedagogical and content knowledge. For practitioners, this means defining outcomes first, selecting tools by function, designing active tasks, combining automated and human feedback, and adopting a transparent policy on generative AI.

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THRESHOLD GAINS AND THE ACTION GAP: RE-EXAMINING A DIALOGIC–REFLECTIVE METHODOLOGY FOR SPIRITUAL-MORAL COMPETENCE IN UZBEK LOWER-SECONDARY SCHOOLS

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Abstract. *Since 2020, general secondary schools in Uzbekistan have taught Tarbiya (upbringing) as a discrete subject, and the policy rationale presumes that classroom work on values will surface in students' conduct. This article asks what a recent quasi-experimental evaluation of a dialogic–reflective methodology for Grades 5–9 can legitimately claim about that presumption. Using the aggregated records of a two-year pedagogical experiment conducted by the author, I re-analyse the band frequencies for 594 classified observations from six schools in Tashkent, Fergana and Samarkand across two school years. The experimental advantage is large and strikingly uniform across regions: 74.3% of experimental-group students reached the good or excellent bands against 26.2% of controls, $\chi^2(2, N = 594) = 140.07$, Cramér's $V = .49$, and the probability that a randomly drawn experimental student outranks a control student is .75. The apparent size of the effect, however, depends heavily on the metric; a ratio of criterion means of 1.13–1.15 and a ratio of above-threshold proportions of 2.84 describe the same data. I argue that the gain is best read as a threshold shift out of the minimal band, and that the near-identical improvement across motivational, cognitive, creative and praxeological criteria leaves the decisive link in the model's own know–believe–act chain, the passage from conviction to conduct, empirically underdetermined. Implications for assessment in the Tarbiya subject are discussed.*

Keywords: *spiritual-moral competence, Tarbiya, values education, quasi-experiment, effect size, judgment–action gap, Uzbekistan*

Introduction

When the Cabinet of Ministers of Uzbekistan introduced *Tarbiya* as a phased school subject in 2020 (Cabinet of Ministers of the Republic of Uzbekistan, 2020), it attached an expectation to a timetable slot. The Concept of Continuous Spiritual Education, adopted a few months earlier, had already called for outcome indicators and for cooperation among family, school and *mahalla* (Cabinet of Ministers of the Republic of Uzbekistan, 2019), and the Law on Education framed upbringing as a statutory aim alongside instruction (Republic of Uzbekistan, 2020). Read together, these documents treat moral formation as something that can be planned, taught and eventually checked. The difficulty begins with the checking.

International assessment programmes are instructive here. The IEA International Civic and Citizenship Education Study separates civic knowledge from attitudes and from expected or actual participation, and it repeatedly finds that the three do not move in lockstep (Schulz et al., 2018). The OECD Survey on Social and Emotional Skills shows that dispositions such as responsibility, empathy and tolerance vary with age and social context in ways a single score can hide (OECD, 2021). Neither programme accepts a gain in what students know or endorse as proof that they will

behave differently. The Incheon framework sets the ambition far higher, tying schooling to human rights, a culture of peace and global citizenship (UNESCO, 2016). National *Tarbiya* policy has inherited that ambition. It has not always inherited the measurement caution.

This article examines one carefully specified attempt to meet the ambition. I designed and tested a methodology for developing what Uzbek pedagogy calls *ma'naviy-tarbiyaviy kompetensiya* in Grades 5–9, using the *Tarbiya* subject as its vehicle, extending earlier work on creative thinking in *Tarbiya* lessons and on the place of literature in forming this competence (Eshpulatov, 2022, 2023). The term is usually rendered in English as "spiritual and educational competence." I use *spiritual-moral competence* instead, because *tarbiyaviy* refers here to upbringing in the sense of character formation, not to schooling at large, and the narrower English term keeps the construct distinct from academic attainment. The methodology rests on an explicit chain, *bilish–ishonch–amal* (knowing–believing–acting): students first understand moral and social values, then hold them as personal conviction, and finally display them in conduct, a sequence close to Lickona's (1991) triad discussed below.

Three questions follow from that chain. How large and how consistent is the reported advantage of the methodology once the recorded frequencies are re-analysed with effect-size statistics that do not hinge on a single cut-point (RQ1)? Does the profile of gains across the four assessed criteria discriminate between the links of the chain (RQ2)? And what, accordingly, does the evidence license about the final, behavioural link (RQ3)?

My answer has two parts. The methodology produced a substantial and regionally stable shift in assessed competence, larger than most school-based social-emotional programmes report. Yet the shift is chiefly a movement of students out of the lowest reported band rather than a near-threefold improvement, and because every criterion rose by almost exactly the same amount, the data cannot distinguish a gain in conduct from a gain in the way students and teachers describe conduct. The acting link is plausible. It has not yet been demonstrated.

Competence, Conviction and Conduct

Post-Soviet competence theory supplied the Uzbek construct with its architecture. Zimnyaya (2003) presented key competencies as a new way of stating educational results and insisted that a competence includes readiness to mobilise knowledge, a value-laden relation to its object and experience of its use. Khutorskoy (2003) placed value-semantic competence first among his key competencies, describing it as the student's capacity to perceive the world through values and to choose a position on that basis. Hutmacher's (1997) report for the Council of Europe made the same move in a Western register, treating competencies as integrations of knowledge, attitude and action required for participation in democratic life. On all three accounts, a competence that never reaches action is, strictly speaking, not yet a competence.

Character education and moral psychology arrive at a similar triad but are more sceptical about its joints. Lickona (1991) described good character as knowing the good, desiring the good and doing the good, a formula almost isomorphic with *bilish–ishonch–amal*. Rest (1986) decomposed moral functioning into sensitivity, judgment, motivation and implementation, stressing that strength in one component does not guarantee strength in the next. Blasi's (1980) review remains the classic statement of the problem: across dozens of studies, associations between moral reasoning and moral behaviour were real but modest, and the bridge between them ran through responsibility and self-identity rather than through cognition alone.

For *Tarbiya*, the implication is direct. A methodology that improves dilemma discussion may well strengthen judgment and motivation while leaving implementation much as it was.

Dewey (1916) located the remedy in participation, arguing that dispositions grow through shared activity whose consequences learners experience, not through talk about dispositions. The civic-education tradition represented by Branson (1998) and by Quigley and Bahmueller (1991) operationalised this as a combination of civic knowledge, intellectual and participatory skills, and civic dispositions, each requiring its own form of evidence. The methodology examined here honours the Deweyan point through civic and social projects and through school–family–*mahalla* collaboration. Whether the evaluation honours it as well is a separate matter.

Biesta (2009) warns that education under measurement tends to value what it can measure and then redefine its purposes around the measurable. In values education the temptation is acute, because questionnaires and teacher ratings are cheap and behaviour sampling is not. The framework adopted here therefore treats each link of the chain as an evidential claim with its own requirements and reads the reported results against those requirements, not against the model's intentions.

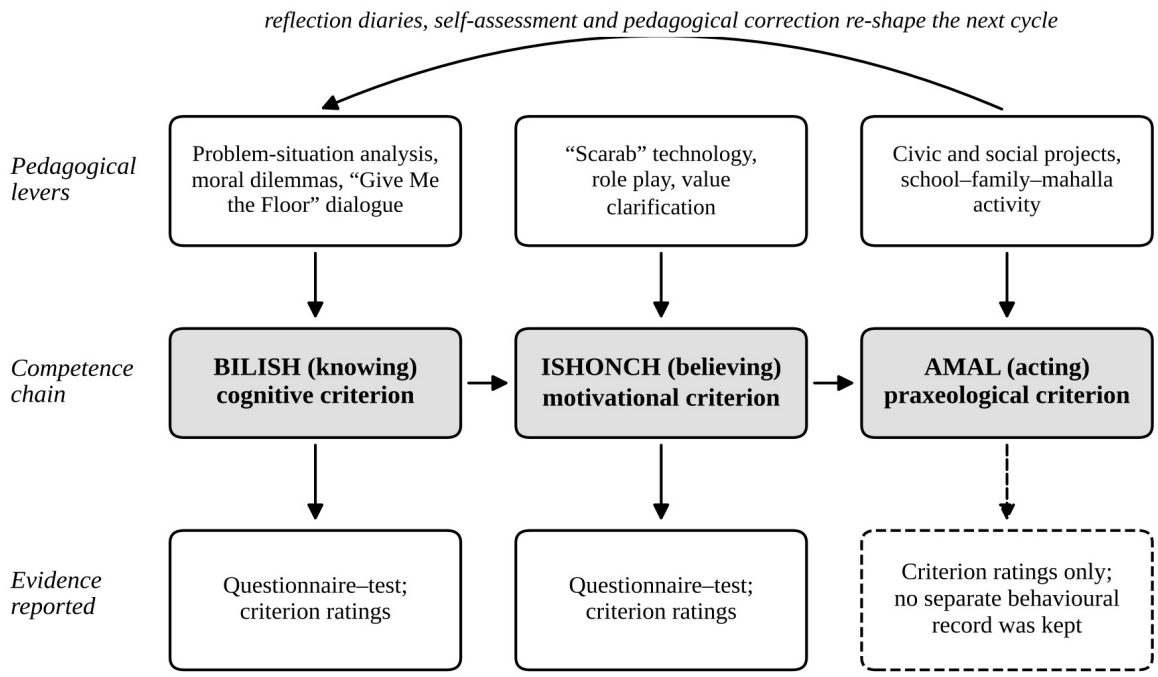
The Methodology Under Examination

The intervention combined four components, labelled in the underlying model as target, pedagogical, complex and result components. The pedagogical component specified three conditions: a value-oriented organisation of lessons integrating national and universal values; activity-based upbringing technologies such as socially useful work, volunteering and collective projects; and an age-sensitive sequence of forms moving from conversation and role play towards case study and social project. Two named techniques carried much of the classroom work. The "Give Me the Floor" (*Menga so'z bering*) method structures turn-taking so that every student must state and justify a position on a value conflict, and the interactive "Scarab" technology organises collaborative idea generation around a problem before ideas are evaluated. Reflection diaries, portfolios and a "My decision and its consequence" analysis served self-assessment, and pedagogical correction was applied when monitoring showed a student falling behind.

Implementation passed through analytical, organisational, activity, monitoring and outcome stages, with diagnostic, formative and summative assessment attached to them. The diagnostic stage of the study had documented the starting point: *Tarbiya* lessons were often monologic and reproductive, so students absorbed values "at the level of knowing" without practising choice. The methodology is best understood as a deliberate move from transmission to dialogue, reflection and project work. Figure 1 maps its levers onto the competence chain and marks where the reported evidence sits.

Figure 1

Pedagogical Levers, the Know–Believe–Act Chain and the Location of Reported Evidence



Note. Conceptual illustration constructed for this article from the components, methods and criteria of the methodology; it is a simplified analytical view, not the full pedagogical model. The dashed box marks the link for which the experiment recorded no separate behavioural evidence.

Figure 1 exposes an asymmetry. The first two links are each observed through two sources, a questionnaire–test battery and criterion-based ratings. The acting link is observed through criterion ratings alone, and the experiment kept no separate behavioural record such as incident logs, peer nominations or audited project outputs.

Method

Design and Participants

The study was a pedagogical experiment with a quasi-experimental, non-equivalent groups design conducted in six general secondary schools: Nos. 90 and 201 in Tashkent, Nos. 47 and 50 in Fergana Region, and Nos. 30 and 31 in Samarkand Region. In total, 360 students took part, with 358 in the first and 354 in the second experimental year. Final-stage band distributions are available for 298 students in 2022–2023 (150 experimental, 148 control) and 296 in 2023–2024 (146 experimental, 150 control). Baseline equivalence of the groups is asserted, and baseline upper-band proportions are reported for both outcome measures.

Outcome Measures

Two families of outcomes were reported. A questionnaire–test battery yielded the share of students rated excellent or good. Criterion-based assessment combined observation, expert judgment and analysis of student products against four criteria (motivational, cognitive, creative and praxeological); it was summarised both as a composite banded into excellent (33–39 points), good (28–32) and satisfactory (21–27) and as a mean for each criterion. The original analysis used Student's *t* test and an efficiency coefficient defined as the ratio of experimental to control results.

Analytic Strategy

The present analysis works from the aggregated band frequencies, pre–post proportions and criterion means recorded at the end of the experiment rather than from item-level responses. Three sets of quantities were computed. For the pooled and year-specific band distributions, I calculated a 2 × 3 chi-square test with Cramér's *V*, an odds ratio for reaching the good-or-better bands, and the probability of superiority (PS): the probability that a randomly chosen experimental student falls in a higher band than a randomly chosen control student, with ties counted as one half. From the reported pre- and post-test figures I derived difference-in-differences in upper-band proportions. For the criterion means I computed raw differences and ratios. PS was preferred as the headline index because it uses the whole ordinal distribution and is indifferent to the placement of any single threshold.

Standard errors treat students as independent. Since intact classes in a small number of schools were assigned to conditions, they are anti-conservative, and every inferential statement below should be read with that limitation in view (Hedges, 2007; Shadish et al., 2002). Computations were run in Python with SciPy.

Results

Magnitude and Regional Consistency

Table 1 gives the final-stage distributions by region and year. The experimental group outperformed its control in every one of the six region-by-year cells. The share of students at good or above ranged from 70.8% to 78.0% in experimental classes and from 23.1% to 30.4% in control classes, while PS stayed within a narrow interval of .735 to .770.

Table 1

Final-Stage Band Distribution by Region and School Year

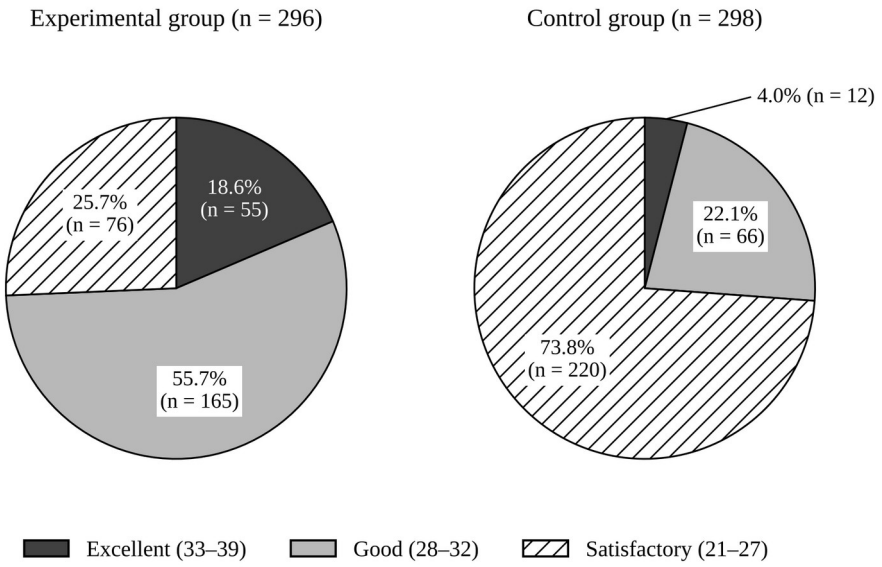
Year	Region	EG *n*	EG E / G / S	EG good+ (%)	CG *n*	CG E / G / S	CG good+ (%)	PS
2022–2023	Tashkent	54	10 / 29 / 15	72.2	52	2 / 10 / 40	23.1	.753
	Fergana	48	8 / 28 / 12	75.0	50	2 / 11 / 37	26.0	.752
	Samarkand	48	9 / 27 / 12	75.0	46	2 / 12 / 32	30.4	.735
	Subtotal	**150**	**27 / 84 / 39**	**74.0**	**148**	**6 / 33 / 109**	**26.4**	**.747**
2023–2024	Tashkent	50	11 / 28 / 11	78.0	52	2 / 12 / 38	26.9	.770
	Fergana	48	9 / 27 / 12	75.0	50	2 / 11 / 37	26.0	.754
	Samarkand	48	8 / 26 / 14	70.8	48	2 / 10 / 36	25.0	.735
	Subtotal	**146**	**28 / 81 / 37**	**74.7**	**150**	**6 / 33 / 111**	**26.0**	**.753**
Pooled	**All regions**	**296**	**55 / 165 / 76**	**74.3**	**298**	**12 / 66 / 220**	**26.2**	**.750**

Note. EG = experimental group; CG = control group; E / G / S = number of students in the excellent (33–39 points), good (28–32) and satisfactory (21–27) bands; good+ = excellent or good; PS = probability of superiority (probability that a randomly chosen EG student is in a higher band than a randomly chosen CG student, ties counted as one half). Counts from the final stage of the experiment; percentages and PS computed for this article.

Pooled across years, the band distributions differed sharply, $\chi^2(2, N = 594) = 140.07$, $p < .001$, $V = .49$ (Figure 2). Experimental students had roughly eight times the odds of reaching the good-or-better bands (OR = 8.16, 95% CI [5.66, 11.79], unadjusted for clustering), and the difference in proportions was 48.1 percentage points, 95% CI [41.1, 55.2]. The two cohorts replicated each other almost exactly, with $V = .48$ in 2022–2023 and $V = .49$ in 2023–2024.

Figure 2

Final-Stage Distribution of Composite Competence Bands, Pooled Across 2022–2023 and 2023–2024



Note. Frequencies from the final stage of the experiment; percentages computed for this article. Score ranges refer to the criterion-based composite.

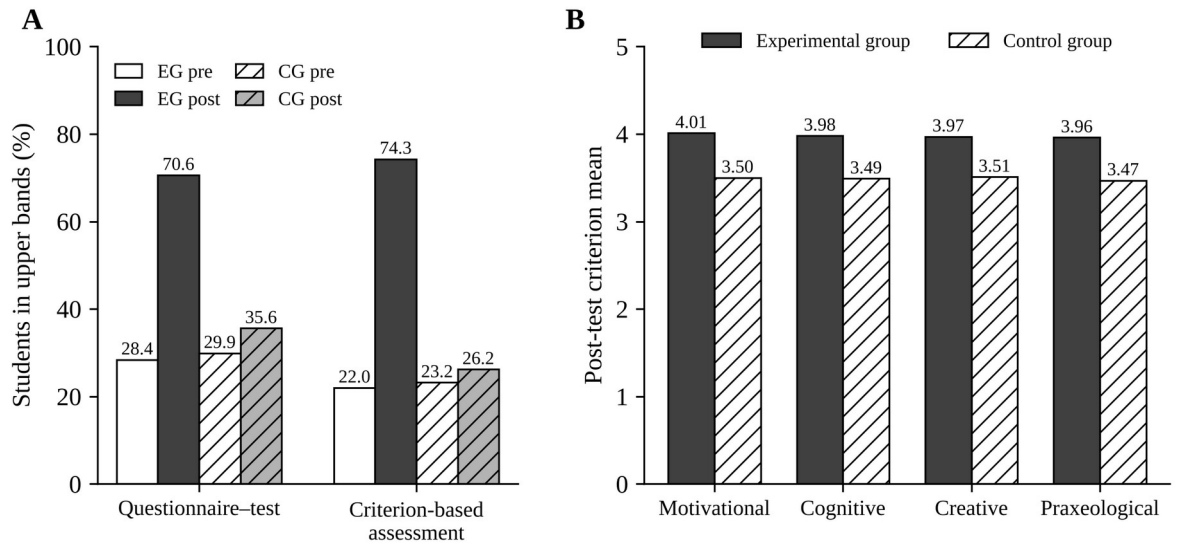
The composition of the gain matters more than its total. The excellent band grew from 4.0% in the control group to 18.6% in the experimental group, a difference of 14.6 points, whereas the satisfactory band shrank from 73.8% to 25.7%, a difference of 48.1 points. Most of the movement was from satisfactory into good. The methodology lifted the floor of the distribution far more than it raised the ceiling.

Change Over Time

The pre–post figures in Figure 3A show that this pattern did not exist at baseline. On the questionnaire–test battery the upper-band share rose from 28.4% to 70.6% in experimental classes and from 29.9% to 35.6% in control classes, a difference-in-differences of 36.5 percentage points. On the criterion-based assessment the corresponding change was from 22.0% to 74.3% against 23.2% to 26.2%, a difference-in-differences of 49.3 points. The larger net effect therefore appears on the measure that relies on teacher and expert judgment.

Figure 3

Pre–Post Change in Upper-Band Proportions (Panel A) and Post-Test Criterion Means (Panel B)



Note. EG = experimental group; CG = control group. Panel A: percentage of students in the excellent or good categories before and after the experiment, Panel B: post-test criterion means, plotted on an axis starting at zero so that the gaps are not visually exaggerated.

Dimensional Profile

Experimental means lay between 3.96 and 4.01 and control means between 3.47 and 3.51 (Figure 3B). The raw differences were 0.51 for the motivational criterion, 0.49 for the cognitive, 0.46 for the creative and 0.49 for the praxeological. Their ratios, 1.13 to 1.15, are the source of the "15% higher" result in the original analysis. Without standard deviations the differences cannot be standardised, but a spread of 0.05 points among them is far too small to rank the dimensions.

Three Descriptions of One Effect

Table 2 sets the competing summaries side by side. The same data support the statements that experimental students scored about 14% higher, that they were 2.84 times as likely to reach the upper bands, and that they had eight times the odds of doing so. None of these statements is false; each answers a different question. The ratio of proportions is the most sensitive to where the cut-point lies, because when nearly three-quarters of a control group sits just below a threshold, a moderate shift of the whole distribution becomes a large multiplicative gain in the share above it.

Table 2

Alternative Summaries of the Experimental Effect and What Each Conveys

Index	Value	Question answered	Main sensitivity
Ratio of criterion means (EG/CG)	1.13–1.15	How much higher is the average rating?	Depends on the scale origin; ignores dispersion
Raw difference in criterion means	0.46–0.51	How many scale points separate the groups?	Cannot be standardised without *SD*s

Index	Value	Question answered	Main sensitivity
Ratio of upper-band proportions	2.84 (criteria); 1.98 (questionnaire–test)	How many times as many students cross the threshold?	Strongly dependent on cut-point placement
Odds ratio, good or better	8.16 [5.66, 11.79]	How do the odds of crossing the threshold compare?	Cut-point dependent; grows as base rates diverge from 50%
Difference in proportions	48.1 pp [41.1, 55.2]	How many more students per hundred cross it?	Cut-point dependent
Difference-in-differences	49.3 pp (criteria); 36.5 pp (questionnaire–test)	How much more did EG improve than CG?	Assumes parallel trends without intervention
Probability of superiority	0.75	How often does a random EG student outrank a random CG student?	Uses the full ordinal distribution; no single cut-point

Note. EG = experimental group; CG = control group; pp = percentage points. Ratios of means and of proportions as computed in the original analysis; remaining values computed for this article from the band frequencies. Bracketed values are 95% confidence intervals, not adjusted for clustering of students within classes and schools.

Discussion

Threshold Gains, Not Threefold Gains

Under a normal approximation, a PS of .75 corresponds to a standardised mean difference of about 0.95. That is large for a school-based values intervention. Durlak et al. (2011) reported mean effects of 0.57 on social-emotional skills, 0.23 on attitudes and 0.24 on positive social behaviour, mostly from randomised studies. Two features of the present design probably inflate the estimate: outcomes were assessed by people who knew which classes had received the methodology, and the composite mixed self-report with rater judgment. Even after a generous discount, the effect remains educationally meaningful.

What it is not is a near-tripling of competence. The multiplicative figures in the original analysis, 1.98 and 2.84, are ratios of shares above a threshold that most control students did not cross. The most defensible verbal summary is that the methodology moved roughly half of the cohort from minimal to adequate competence while modestly enlarging the top band. For a compulsory subject only a few years old, that is precisely the result one would want first. The diagnostic stage found that many students left *Tarbiya* lessons able to reproduce correct answers but not to defend a choice, and a technique such as “Give Me the Floor,” which obliges every student to articulate and justify a position, acts most directly on the students who would otherwise stay silent.

The design of the methodology predicts this shape. Pedagogical correction was triggered by monitoring and directed at students who lagged, and the dialogic techniques distribute speaking

turns rather than reward the already fluent. An intervention organised around the weakest participants should compress the lower tail before it extends the upper one, which is what Figure 2 shows. If later iterations aim to enlarge the excellent band as well, they will probably need differentiated tasks for students who have already crossed the threshold, for instance leadership roles in civic projects or written argument on contested cases, rather than more of the same dialogue.

Uniformity as an Interpretive Problem

The four criteria were meant to capture different things. If the knowing–believing–acting chain behaved as moral psychology predicts, cognitive and motivational gains should exceed praxeological ones, since action depends on the earlier links plus situational supports (Blasi, 1980; Rest, 1986). Durlak et al.'s (2011) pattern, with skill effects more than twice as large as behaviour effects, points the same way. Instead, the praxeological difference (0.49) matched the cognitive one and trailed the motivational one by only 0.02.

Two explanations fit this result. The first, favourable to the model, is that civic projects and school–family–*mahalla* activity gave students enough supervised practice for conduct to keep pace with understanding, so that the chain advanced as a unit. The second is common-method variance: if all four criteria were scored largely by the same raters from the same observation episodes and products, a global impression of each student, coloured by visible engagement in the new lessons, would lift every criterion together. Inter-criterion correlations and rater-level information were not part of the aggregated record, so the two accounts cannot yet be separated. The uniform profile is consistent with genuine integration and equally consistent with a halo.

The larger difference-in-differences on criterion-based assessment (49.3 points) than on the questionnaire–test battery (36.5 points) tilts slightly towards the second explanation, since the criterion assessment is the more judgment-dependent measure. The tilt is slight. Criterion assessment also included analysis of student products, where real differences in project work would be expected to register.

What the Evidence Licenses

The data establish with reasonable confidence that students taught with the methodology described and endorsed values more competently than comparison students at the end of the year, and that this held in three regions and two cohorts. They establish less firmly that those students acted differently. Biesta's (2009) caution takes a specific form here: if *Tarbiya* comes to be judged by questionnaires and ratings alone, the subject's working aim will drift towards articulacy about values, which is worth having but is not what the policy documents promise.

A further conceptual issue concerns the study's own design. Its criteria were named in three vocabularies. The statements of the methodology's novelty refer to social orientation, level of trust and social behaviour; the pedagogical model refers to cognitive, axiological and reflective-evaluative requirements; and the experimental assessment used motivational, cognitive, creative and praxeological criteria. The three are compatible, but they were never formally reconciled, and the reconciliation determines what each score can be taken to show. Table 3 proposes a crosswalk that aligns each vocabulary with the chain and with the evidence each link would need.

Table 3

Crosswalk of Criterion Vocabularies, Competence Links and Evidence Requirements

Link in the chain	Model requirement (diagram)	Empirical criterion	Indicator in novelty statement	Evidence reported	Evidence needed
Knowing (*bilish*)	Cognitive	Cognitive	—	Questionnaire–test; criterion ratings	Scenario-based judgment tasks scored by raters blind to condition
Believing (*ishonch*)	Axiological	Motivational	Social orientation; level of trust	Questionnaire–test; criterion ratings	Value-priority measures with reported reliability; delayed re-test
Acting (*amal*)	Activity-based technologies	Praxeological	Social behaviour	Criterion ratings	Blind structured observation; peer nomination; audited project records
Regulation and transfer	Reflective-evaluative	Creative	—	Not reported separately	Coded reflection diaries and “My decision and its consequence” analyses

Note. The alignment is an interpretive synthesis of terms used in different parts of the study’s design; it was not part of the original experimental analysis. A dash indicates that the novelty statements name no corresponding indicator.

The crosswalk yields three recommendations for assessment in *Tarbiya*. Effect sizes should be reported on the full score distribution with cluster-appropriate standard errors, and any ratio should be accompanied by the threshold that produced it. The acting link needs evidence of its own, whether structured observation by raters blind to condition, peer nomination or audited records of individual contributions to projects, collected at least once after the intervention has ended. And the reflective instruments already built into the methodology, the diaries and “My decision and its consequence” analyses, deserve to be coded as data on how students connect conviction to conduct rather than used only as teaching devices.

The *mahalla* deserves particular attention in this respect. The methodology already treats school–family–*mahalla* cooperation as a condition of continuity, and neighbourhood activity is where conduct outside the classroom becomes visible to adults other than the teacher. Structured

reports from *mahalla* activists or project partners could supply exactly the independent evidence the acting link lacks. They would also bring their own bias, since community observers tend to reward conformity and visibility, so such reports would need explicit behavioural anchors and should be triangulated against peer and self-accounts rather than substituted for them.

Limitations

This analysis has clear limits. It relies on aggregated results, so standard deviations, intraclass correlations and inter-criterion correlations are unavailable, and all inferential statistics treat students as independent. The band table accounts for 298 and 296 students, fewer than the 358 and 354 who took part; students outside the three reported bands are not represented, and the pooled estimates would shift if they were scored below the lowest band. The distributions for the two years are nearly identical, including a constant count of two excellent students in every control cell, which may reflect stable implementation and cohort composition but should be verified against the raw records. Finally, conditions were assigned by school and class rather than at random, so pre-existing differences in school culture cannot be excluded despite baseline equivalence on the outcome measures (Shadish et al., 2002).

Generalisability is a separate constraint. Grades 5 to 9 span roughly ages 11 to 15, a period in which social and emotional dispositions shift noticeably with age (OECD, 2021), yet results are reported for the whole span. Whether a Grade 5 pupil and a Grade 9 student responded to the same dialogic format in the same way cannot be determined from the aggregated data, and all six sites were state general secondary schools, so specialised and private schools are not represented.

Conclusion

Tarbiya entered Uzbek schools carrying an implicit promise that classroom work on values would reach students' conduct. The methodology examined here, built on dialogue, reflection and civic projects, delivered a large and replicable improvement in assessed spiritual-moral competence among students in Grades 5–9: across three regions and two school years, roughly three in four experimental students reached the good or excellent band, compared with one in four controls. Re-analysed, the improvement is best described as a threshold shift that lifts the floor of the distribution, and its size is better conveyed by a probability of superiority of .75 than by efficiency ratios that depend on where bands are cut.

The uniformity of gains across criteria is the most intriguing result and the least resolved. It may show that the knowing–believing–acting chain moves as a whole when students practise values in real projects, or it may show that the instruments cannot yet tell the links apart. The difference matters for policy, because a subject certified by questionnaires and ratings will, over time, teach students to speak well about values. The next study of this methodology should spend its effort on the last link, gathering independent, delayed and behavioural evidence of what students actually do. Only there will the claim of competence, as Zimnyaya, Khutorskoy and Hutmacher each defined it, meet its real test.

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PROFESSIONAL COMPETENCE OF THE CLIL TEACHER AND COLLABORATION BETWEEN LANGUAGE AND SUBJECT TEACHERS IN DEVELOPING STUDENTS' COMMUNICATIVE COMPETENCE

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Abstract. *The article examines the professional competence of the CLIL (Content and Language Integrated Learning) teacher and the collaboration between language and subject teachers as key conditions for developing university students' communicative competence. It analyses the theoretical foundations of teacher competence, including L.S. Shulman's concept of pedagogical content knowledge, A.K. Markova's model of professional competence and the European Framework for CLIL Teacher Education. The components of the CLIL teacher's professional competence are identified and described: subject, linguistic, methodological, interactional, intercultural, digital and reflective competences. Particular attention is paid to language awareness, which enables subject teachers to recognise the language demands of content tasks and to support students' academic communication. The article also describes models of collaboration between language and subject teachers, from consultation and parallel teaching to team teaching, and proposes a procedure for joint lesson planning. It is argued that the systematic development of teachers' competences and institutionalised collaboration between departments are necessary for CLIL to fulfil its potential in developing students' communicative competence.*

Keywords: *CLIL, teacher competence, CLIL teacher education, language awareness, collaboration, co-teaching, team teaching, joint lesson planning, communicative competence, higher education*

Introduction. The modernisation of higher education in Uzbekistan is closely linked with the internationalisation of universities and the introduction of teaching specialised subjects in foreign languages. The Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030 [1] sets the task of raising the quality of training to international standards and expanding academic mobility of students and teachers. Content and Language Integrated Learning (CLIL) is one of the approaches that can help achieve these goals, since it develops students' subject knowledge and their ability to communicate about this knowledge in a foreign language at the same time.

However, the effectiveness of CLIL depends to a great extent on the teacher. A CLIL lesson requires the teacher to pursue both content and language objectives, to anticipate the language difficulties students will face, to organise interaction in which students actively use the foreign language and to provide appropriate support. In practice, these demands often exceed the training that teachers have received. Subject teachers usually have deep knowledge of their discipline but limited awareness of how language works in learning, whereas language teachers are well prepared to teach language but are often unfamiliar with the content and discourse of specialised subjects.

Therefore, two closely related issues become central for the successful implementation of CLIL: the professional competence of the CLIL teacher and collaboration between language and subject teachers. The aim of this article is to describe the structure of the CLIL teacher's professional competence, with special emphasis on competences related to developing students' communicative competence, and to substantiate models and procedures of collaboration between language and subject teachers in higher education.

Theoretical background of teacher competence. The concept of professional competence of teachers has been widely discussed in psychology and pedagogy. A.K. Markova [2] considers professional competence as the psychological state of a professional that allows him or her to act independently and responsibly, and distinguishes special, social, personal and individual types of competence. I.A. Zimnyaya [3] defines competence as an integrated, activity-based characteristic of a person that includes knowledge, skills, experience, values and the readiness to apply them in professional situations. These approaches emphasise that teacher competence is not limited to knowledge of a subject but involves the ability to use this knowledge flexibly in real teaching contexts.

L.S. Shulman [4] introduced the concept of pedagogical content knowledge, that is, the special knowledge which allows a teacher to transform subject content into forms that are comprehensible to learners. This idea was later extended by P. Mishra and M.J. Koehler [5] in the TPACK framework, which adds technological knowledge as a third dimension. In the context of CLIL, pedagogical content knowledge acquires an additional linguistic dimension: the teacher must know not only how to make content accessible, but also how to make it accessible through a foreign language and how to use content as a resource for language development.

CLIL teacher competences. Within the European context, several frameworks describing CLIL teacher competences have been developed. The European Framework for CLIL Teacher Education, prepared by D. Marsh, P. Mehisto, D. Wolff and M.J. Frigols Martín [6], identifies target professional competences such as personal reflection, knowledge of CLIL fundamentals, content and language awareness, methodology and assessment, research and evaluation, learning resources and environments, classroom management, CLIL management and interculturality. P. Bertaux, C.M. Coonan, M.J. Frigols-Martín and P. Mehisto [7] developed the CLIL Teacher's Competences Grid, which describes competences needed for planning and teaching CLIL lessons, including the integration of content and language objectives and the creation of a rich interactive learning environment.

D. Coyle, P. Hood and D. Marsh [8] emphasise that CLIL teachers must be able to plan lessons according to the 4Cs Framework, ensuring that content, communication, cognition and culture are integrated. P. Mehisto, D. Marsh and M.J. Frigols [9] stress the importance of scaffolding, active learning, authenticity and a safe learning environment in which students feel comfortable using the foreign language. V. Pavón Vázquez and M. Ellison [10], analysing teacher roles in CLIL, point out that both content and language teachers need to redefine their roles: subject teachers must take responsibility for the language of their discipline, and language teachers must become more familiar with subject content.

Components of the CLIL teacher's professional competence. Based on the analysis of the literature, the following components of the CLIL teacher's professional competence can be distinguished. Subject competence includes deep knowledge of the discipline, its key concepts and typical forms of reasoning. Linguistic competence includes a sufficient level of foreign language proficiency (at least B2, preferably C1 according to the CEFR [11]) and command of the academic

and professional discourse of the subject. Methodological competence covers the ability to formulate dual-focused objectives, select and adapt materials, design tasks of increasing cognitive complexity and apply scaffolding strategies. Interactional competence involves the ability to organise pair and group work, ask questions that stimulate extended answers, manage classroom discussion and provide feedback. Intercultural competence enables the teacher to integrate cultural dimensions into content and to develop students' openness to other perspectives. Digital competence ensures the purposeful use of technologies to support content and language learning. Finally, reflective competence allows the teacher to analyse his or her own practice and continuously improve it.

Among these components, interactional competence is of particular importance for developing students' communicative competence. C. Dalton-Puffer [12] showed that the nature of teacher questions largely determines the quality of students' oral participation in CLIL classes: questions requiring explanations, reasons and opinions lead to longer and more complex student contributions than questions about facts. Consequently, the CLIL teacher must consciously plan questioning strategies, give students sufficient wait time and encourage them to elaborate on their answers.

Language awareness of subject teachers. One of the most important and, at the same time, most problematic competences of subject teachers in CLIL is language awareness. It refers to the teacher's ability to recognise the language demands of content tasks: the vocabulary, grammatical structures and discourse patterns students need in order to define, describe, compare, explain, argue and evaluate in a particular discipline. P. Ball, K. Kelly and J. Clegg [13] note that in CLIL language is closely tied to the cognitive functions of content, and therefore subject teachers should be able to identify the "language of the subject" and make it explicit for students.

R. Lyster [14] proposes a counterbalanced approach in content-based instruction, according to which the teacher shifts students' attention between content and language depending on their needs. In a content-oriented lesson, the teacher periodically draws attention to language forms; in a language-oriented lesson, the teacher ensures that meaningful content is present. P. Gibbons [15] also stresses that teachers should plan the language required for each task and build bridges between students' everyday language and the academic language of the subject. Without such language awareness, subject teachers may unintentionally create situations in which students understand content but are unable to express it, which limits the development of their communicative competence.

Collaboration between language and subject teachers. Since it is difficult for one teacher to possess all the competences required by CLIL to the same degree, collaboration between language and subject teachers is considered one of the most effective ways of ensuring quality. A. Creese [16], studying teacher collaboration in multilingual classrooms, found that the status of language and subject teachers is often unequal and that language teachers are frequently seen as "helpers" rather than as equal partners. Such inequality reduces the effectiveness of collaboration. C. Davison [17] proposed a framework describing the development of collaboration between language and content teachers through several stages, from pseudo-compliance and compliance to accommodation, convergence and, finally, creative co-construction, in which teachers share responsibility for both content and language outcomes.

In general education, M. Friend and colleagues [18] described several models of co-teaching, including one teach – one observe, station teaching, parallel teaching, alternative teaching and team teaching. A. Honigsfeld and M.G. Dove [19] adapted these models to the

context of teaching content to English learners and emphasised that successful collaboration requires joint planning, shared instruction, joint assessment and reflection. Taking these ideas into account, the following models of collaboration between language and subject teachers can be proposed for CLIL in higher education (Table 1).

Table 1. Models of collaboration between language and subject teachers in CLIL

Model	**Description**	**Contribution to students' communicative competence**
Consultation	The subject teacher consults the language teacher on the language demands of materials and tasks; teaching is done separately.	Language demands of content tasks are identified; key terms and phrases are pre-taught.
Coordinated (parallel) teaching	Language and subject courses are synchronised by topics; the language teacher prepares students for the language of upcoming subject lessons.	Students practise the vocabulary and speech functions they will need in subject classes.
Adjunct model	A language course is linked to a specific subject course and focuses on its texts, genres and communicative tasks.	Students develop academic speaking and writing skills on the basis of real subject content.
Team teaching	Both teachers plan and teach the lesson together, sharing responsibility for content and language objectives.	Students receive integrated support and feedback on both content and language during interaction.
Joint assessment	Teachers develop common criteria and assess students' projects and presentations together.	Students receive balanced feedback on content accuracy and communicative quality of their speech.

The choice of model depends on institutional conditions, teachers' language proficiency, the timetable and the stage of CLIL implementation. At the initial stage, consultation and coordinated teaching are the most realistic options, since they do not require significant changes in the organisation of the educational process. As teachers gain experience and trust, it becomes possible to move to the adjunct model and team teaching, which provide the greatest opportunities for integrating content and language and for developing students' communicative competence.

Joint lesson planning. Joint planning is the core of any form of collaboration. We propose the following procedure for joint planning of a CLIL lesson. At the first step, the subject teacher defines the content objectives and selects the key concepts and materials. At the second step, both teachers analyse the materials and tasks in order to identify the language of learning (key terms and structures), the language for learning (phrases needed to discuss, ask questions, present and argue) and potential language difficulties. At the third step, the language objectives are formulated, with special attention to the communicative functions students will perform in the lesson. At the fourth

step, the teachers design interactive tasks (discussions, information gap tasks, problem solving, presentations) and prepare scaffolding materials such as glossaries, sentence frames and graphic organisers. At the fifth step, they agree on assessment criteria that cover both content and communication. Finally, after the lesson, the teachers jointly reflect on its results and plan the necessary adjustments.

Such a procedure ensures that communication is not left to chance but is deliberately planned as part of the lesson. It also helps both teachers to learn from each other: subject teachers develop language awareness, while language teachers deepen their understanding of subject content and discourse. As J.J. Jalolov [20] emphasises, foreign language teaching becomes effective when it is based on the principle of communicativeness and when language is used to solve tasks that are meaningful for learners.

Professional development of CLIL teachers. Research shows that teachers involved in CLIL feel a strong need for specific professional development. M.L. Pérez-Cañado [21], surveying in-service CLIL teachers, found that they reported the greatest training needs in methodology, materials development, the use of interactive techniques and the assessment of both content and language, as well as in improving their own foreign language proficiency. These findings correspond to the challenges observed in Uzbek universities, where subject teachers who teach in English often lack methodological preparation, and language teachers lack experience in working with specialised content.

For higher education institutions of Uzbekistan, the following measures can be recommended: developing special professional development programmes on CLIL methodology for both subject and language teachers; organising joint workshops in which teachers of different departments plan and analyse CLIL lessons together; creating communities of practice and mentoring systems in which experienced CLIL teachers support their colleagues; providing language courses for subject teachers focused on academic and classroom discourse; and including the basics of CLIL methodology in the curricula for training future teachers of foreign languages. Institutional support, including reduced teaching loads for co-teaching and recognition of collaborative work, is also essential.

Conclusion. The professional competence of the CLIL teacher is a complex, integrative characteristic that includes subject, linguistic, methodological, interactional, intercultural, digital and reflective competences. Among them, interactional competence and language awareness are particularly important for developing students' communicative competence, since they enable the teacher to plan the language needed for content tasks, organise meaningful interaction and support students in expressing their ideas in a foreign language.

Collaboration between language and subject teachers compensates for the limitations of each individual teacher and creates conditions for genuine integration of content and language. The models of collaboration described in the article – consultation, coordinated teaching, the adjunct model, team teaching and joint assessment – allow institutions to choose forms appropriate to their conditions and to move gradually towards closer cooperation. The proposed procedure for joint lesson planning ensures that communicative objectives are consciously integrated into CLIL lessons.

Further research will focus on developing a professional development programme for CLIL teachers in Uzbek universities and on creating a set of methodological materials to support collaboration between language and subject teachers.

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DEVELOPING PROFESSIONAL AND PERSONAL READINESS OF CADETS THROUGH AN INDIVIDUALIZED ADAPTIVE LEARNING MODEL

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Abstract. *An individualized adaptive learning model raised the share of cadets at the creative level of professional and personal readiness to 21.9–23.9%, against 10.6–11.6% under conventional instruction. The study addresses a persistent gap in military higher education: professional competence and personal qualities are usually developed in separate courses, while service demands them as one capacity. The model links four blocks (target, content, process-technological and evaluative-resultative). It translates service situations into duty-oriented personal qualities, aligns general military regulations with the structural links of learning activity, and delivers training through individual scenarios, a digital learning environment and differentiated simulation tasks. A pretest–posttest experiment with a control group involved 400 second- and third-year cadets from three military higher education institutions of Uzbekistan (experimental group n = 201, control group n = 199). Readiness was assessed against three criteria (informational, operational-activity and personal-managerial) at three levels (creative, productive and reproductive). At baseline the groups did not differ (Student's $t \leq 0.20$, χ^2 $p > 0.88$). After the intervention the experimental group outperformed the control group on every criterion ($t = 7.48–7.78$, $df = 398$, $p < 0.001$), with medium-to-large effect sizes (Cohen's $d = 0.75–0.78$). Mean scores were 14.4–15.0% higher in the experimental group. The results suggest that professional and personal readiness can be developed as a single pedagogical process when training is anchored in service contexts and adapted to cadets' typological profiles.*

Keywords: *military higher education; cadets; professional readiness; personal qualities; adaptive learning; individualized instruction; simulation-based training; context-based learning.*

1. Introduction

The readiness of a young officer depends as much on character as on knowledge. Commanders must take decisions under uncertainty, lead subordinates and bear responsibility for the outcome. These demands draw on professional competence and on personal qualities at the same moment. International education policy points in the same direction. UNESCO's Incheon Framework for Action calls for quality learning that develops the whole person (UNESCO, 2016). The report of the International Commission on the Futures of Education argues for a new social contract built on cooperation and solidarity (UNESCO, 2021). The OECD Learning Compass 2030 treats knowledge, skills, attitudes and values as one competence that enables learners to act responsibly in complex situations (OECD, 2019).

Military education responds to these demands slowly. Instruction in many military higher education institutions remains explanatory and content-driven. Professional training and the formation of personal qualities are often planned in separate disciplines and assessed with separate instruments. Research on military training shows that transfer to service improves when learning

tasks resemble real duty situations and when practice is spaced, varied and supported by feedback (Salas & Cannon-Bowers, 2001). Simulation and computer-based training make such practice possible without the cost and risk of field exercises (Fletcher, 2009). Adaptive and personalized technologies can further tailor tasks to each learner's level and pace (Xie et al., 2019).

In Uzbekistan, the reform of the Armed Forces and the national strategy "Uzbekistan – 2030" have raised the requirements for officer training. Studies by Uzbek and CIS scholars have examined cadets' professional competencies, moral qualities and individual aspects of training (Mikhaylovskiy, 2005; Volkovitskiy, 2004). However, the development of professional and personal readiness as one process, anchored in service contexts and delivered through individualized adaptive technology, has not been studied as a whole.

This article reports the design and experimental validation of such a process. It addresses three research questions:

1. How can service situations and military regulations be built into learning activity so that professional and personal readiness develop together?
2. What structure should a model of this process have, and how can it be delivered through individualized adaptive learning?
3. Does the model produce statistically reliable gains in readiness compared with conventional instruction?

2. Literature review

Professional and personal readiness. In the CIS tradition of military pedagogy, an officer's readiness is described through competence, mastery and professionalism. Mikhaylovskiy (2005) treats professionalism as the acmeological peak of an officer's development. Volkovitskiy (2004) stresses motivation for professional self-improvement, and Dolmatov (1998) defines competence as knowledge and skills organized for action in extreme conditions. Huntington (1957) framed military professionalism as expertise joined with responsibility and corporate identity. These views share one idea: the officer's professional and personal qualities form a single capacity. Training practice, however, often separates them.

Context-based and experiential learning. Verbitskiy's (1991) theory of context-based learning holds that academic activity should be transformed step by step into professional activity. Learning moves from lectures to tasks that model the content and the social setting of future work. Kolb (2015) describes learning as a cycle of concrete experience, reflection, conceptualization and active experimentation. Both views support training built around real service situations rather than around isolated content.

Adaptive and personalized learning. Systematic reviews show that technology-enhanced adaptive learning adjusts content, sequence and support to the learner's knowledge, preferences and errors (Xie et al., 2019). Applications of artificial intelligence in higher education are growing, but many lack a clear pedagogical rationale and an explicit role for the teacher (Zawacki-Richter et al., 2019). UNESCO guidance therefore asks that such systems serve defined educational goals (Miao et al., 2021). In military pedagogy, Skopylatov (1994) and Bogorev (1999) proposed grouping cadets by adaptivity and adjusting instruction to each group.

Simulation in military training. Simulators allow repeated practice of complex procedures, show the consequences of decisions and record performance objectively (Fletcher, 2009). The science of training adds that practice must be designed around the competencies required on the job (Salas & Cannon-Bowers, 2001).

The gap. These lines of research rarely meet. Context-based learning seldom uses adaptive technology, and adaptive systems seldom target personal qualities. No study known to the author combines service context, regulation-based learning tasks, adaptive delivery and simulation in one model of cadets' professional and personal readiness, and tests it experimentally.

3. Materials and methods

3.1 The model

The model consists of four linked blocks, with a feedback loop from results back to goals (Figure 1).

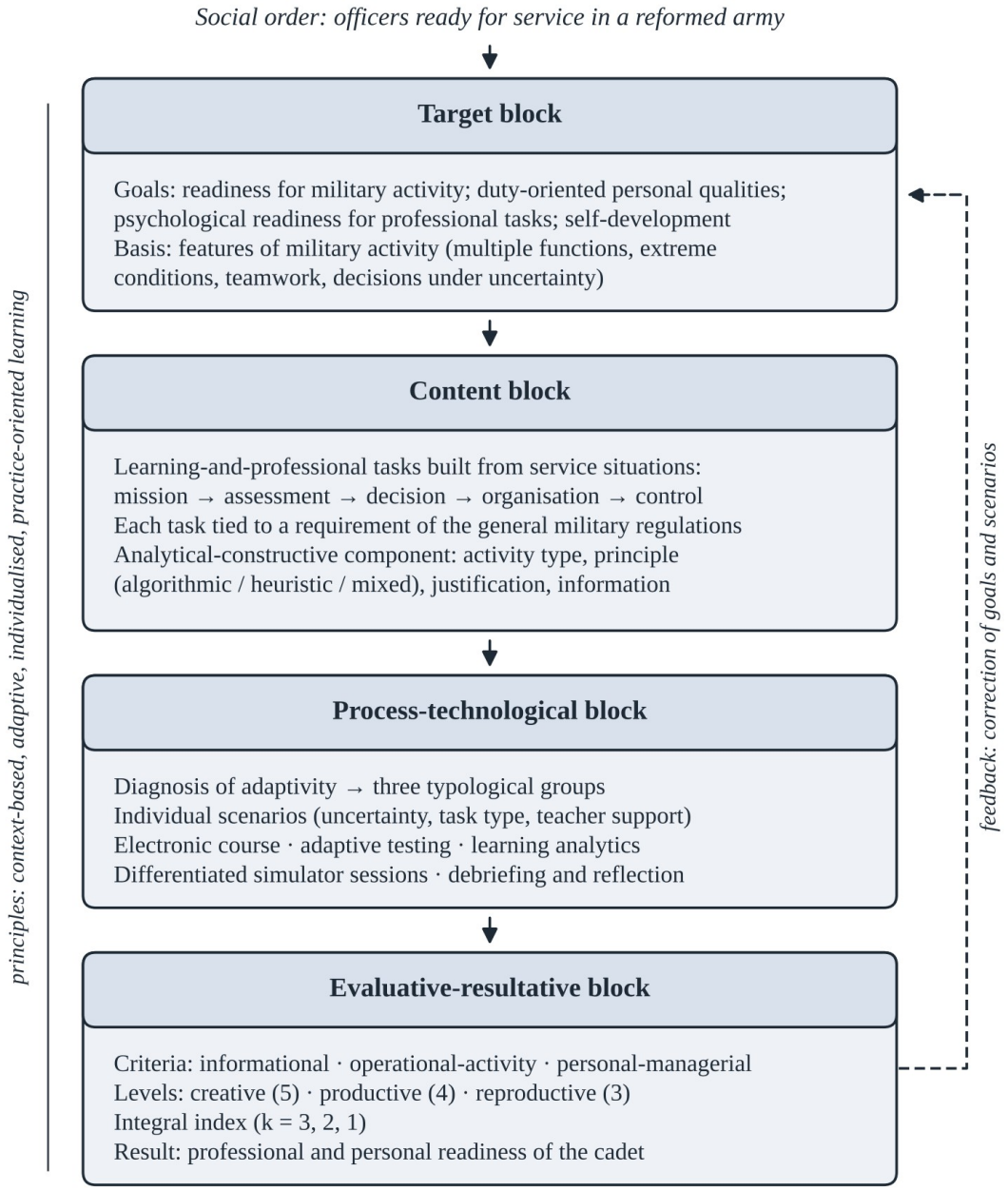


Figure 1. *Individualized adaptive learning model for developing cadets' professional and personal readiness*

Target block. Strategic goals follow from the organizational and methodological features of military activity: multiple functions, extreme conditions, teamwork and decisions under

uncertainty. Four goals are set: readiness for military activity, a system of personal qualities that sustains productive service, psychological readiness for professional tasks, and self-development.

Content block. Content is a system of learning-and-professional tasks. Each task is built from a service situation (accepting a mission, assessing the situation, deciding, organizing subordinates, checking results) and is tied to a requirement of the general military regulations. The task is complemented with elements of the analytical-constructive component of activity: activity type, development principle (algorithmic, heuristic or mixed), justification method and completeness of information.

Process-technological block. Cadets are diagnosed for adaptivity and assigned to one of three typological groups. Each group receives individual scenarios that differ in uncertainty, task type and teacher support. Delivery combines an electronic course, adaptive testing, learning analytics and differentiated simulator sessions.

Evaluative-resultative block. Readiness is assessed on three criteria at three levels (section 3.3). Results feed back into the goals and the scenarios.

Table 1 shows how regulation requirements were aligned with the structural links of learning activity.

Table 1. *Alignment of general military regulations with the structural links of learning activity*

Structural link	Regulation requirement	Learning situation	Duty-oriented quality
Need	Awareness of military duty to defend the homeland	Analysing the social significance of a service task	Patriotism, sense of duty
Motive	Loyalty to the oath, conscientious performance of duties	Choosing between alternatives that carry responsibility	Responsibility, conscientiousness
Goal	Exact and timely execution of the commander's order	Understanding the mission and calculating time	Purposefulness, accuracy
Actions	Order of assessing the situation and making a decision	Tactical task on assessment and decision	Decisiveness, initiative
Means	Rules for safe and effective use of weapons and equipment	Performing actions on a trainer or simulator	Discipline, self-control
Object	Relations with personnel, internal order	Role play on unit command	Exactingness, communication
Result	Combat readiness and discipline of the unit	Analysing the result and self-assessment	Reflection, self-monitoring

3.2 Participants and design

The experiment was conducted in 2024–2025 at three military higher education institutions of Uzbekistan: the Military Aviation Institute, the University of Military Security and Defence, and the Ground Forces Institute. It involved 400 second- and third-year cadets. Intact study groups

were assigned to the experimental condition (n = 201) or the control condition (n = 199), with 133–134 cadets per institution. The design was a pretest–posttest comparison with a control group in three stages: ascertaining, formative and final. During the formative stage, experimental groups were taught with the model, while control groups followed the standard programme. Both conditions covered the same curriculum in general tactics, engineering support and protection against weapons of mass destruction.

3.3 Criteria, levels and instruments

Readiness was measured on three criteria:

Informational: knowledge of the professional field, regulations and interdisciplinary links.

Operational-activity: ability to solve situational and non-standard tasks, make decisions and operate equipment.

Personal-managerial: professional values, stable motives, volitional qualities and organizational skills.

Each criterion was rated at one of three levels, scored 5, 4 and 3 points. At the creative level, the cadet solves heuristic tasks with incomplete information. At the productive level, the cadet solves typical tasks independently. At the reproductive level, the cadet works with step-by-step guidance. Instruments included tests, a cadet questionnaire, an expert rating sheet completed by instructors and commanders, and observation of practical sessions.

3.4 Statistical analysis

Group means were compared with Student's t-test ($\alpha = 0.05$, $df = 398$). Because levels are ordinal, the distributions were also compared with Pearson's χ^2 test ($df = 2$). Effect size was estimated with Cohen's d (Cohen, 1988), and 95% confidence intervals were computed for the means. An efficiency coefficient η was calculated as the ratio of the experimental mean to the control mean.

4. Results

Baseline. Before the intervention the groups were equivalent. On every criterion about 72% of cadets in both groups were at the reproductive level and only 6.0–7.5% at the creative level. Differences in means were negligible ($\eta = 0.997–1.004$), and neither the t-test nor the χ^2 test found a difference (Table 2).

After the intervention. At posttest, 21.9–23.9% of experimental-group cadets reached the creative level, against 10.6–11.6% in the control group, and 55.7–56.2% were at the productive level, against 28.1%. The share of experimental-group cadets at the reproductive level fell from about 72% to 19.9–22.4%. The control group changed little: 60–61% of its cadets remained at the reproductive level (Figure 2).

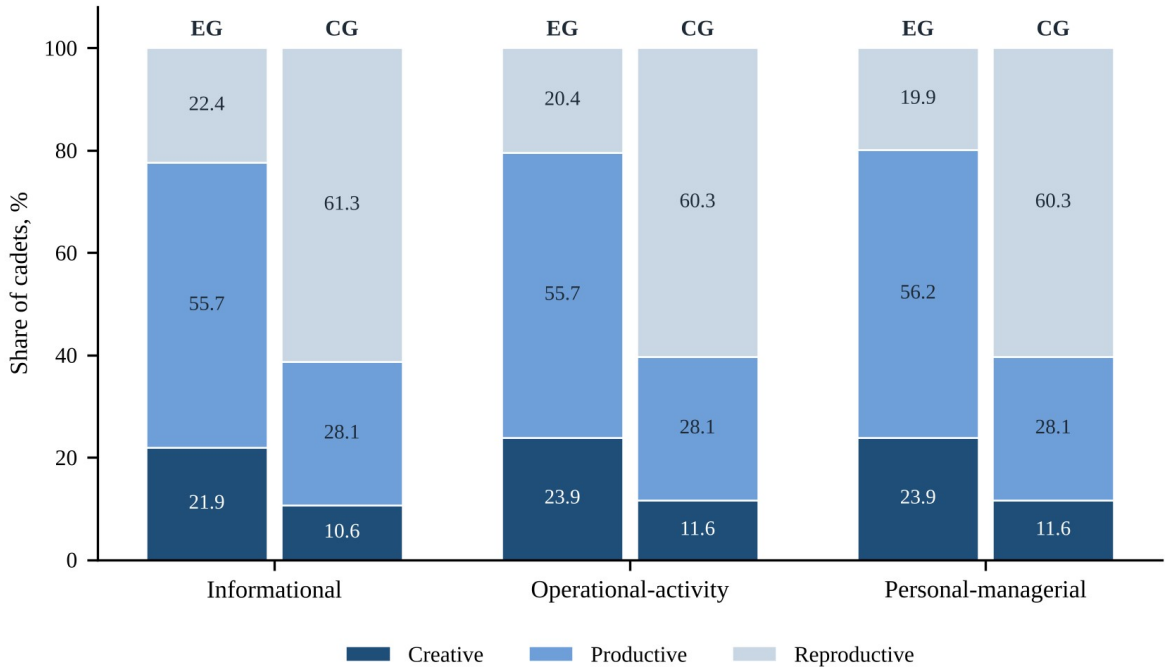


Figure 2. *Distribution of cadets by readiness level at posttest, % (EG n = 201, CG n = 199)*

Table 2. *Group means and test statistics by criterion and stage*

Criterion	Stage	Mean EG	Mean CG	η	t	χ^2	p (χ^2)	d
Informational	Pretest	3.34	3.33	1.004	0.20	0.04	0.98	0.02
Operational-activity	Pretest	3.35	3.36	0.997	0.14	0.24	0.89	−0.01
Personal-managerial	Pretest	3.35	3.35	1.000	0.03	0.13	0.94	0.00
Informational	Posttest	4.00	3.49	1.144	7.48	62.30	< 0.001	0.75
Operational-activity	Posttest	4.03	3.51	1.149	7.69	66.23	< 0.001	0.77
Personal-managerial	Posttest	4.04	3.51	1.150	7.78	68.02	< 0.001	0.78

Note. EG = experimental group (n = 201); CG = control group (n = 199); η = ratio of EG to CG mean; d = Cohen's d. Critical t = 1.97 at α = 0.05, df = 398; χ^2 df = 2.

At posttest, all three t values exceeded the critical value about fourfold, and the χ^2 tests confirmed that the level distributions differed ($p < 0.001$). Effect sizes of d = 0.75–0.78 are medium to large by Cohen's (1988) benchmarks. The experimental means were 14.4–15.0% above the control means. The pattern held in each of the three institutions, with t values from 4.15 to 4.59 within single institutions (critical t = 1.98).

The three criteria moved together. An integral index weighted by task complexity (3 for creative, 2 for productive, 1 for reproductive) rose in the experimental group from 0.448 to 0.674, against 0.502 in the control group at posttest. Across the twelve group-by-stage units the indices for the three criteria correlated at $r \geq 0.996$.

5. Discussion

The findings answer the three research questions. On RQ1, building learning tasks from service situations and tying each structural link of learning activity to a requirement of the general

military regulations (Table 1) allowed professional and personal readiness to be trained in the same task. On RQ2, a four-block model with individual scenarios for three typological groups proved workable in ordinary courses at three institutions. On RQ3, the experimental group gained significantly more than the control group on every criterion, with medium-to-large effects. The gain was not limited to knowledge: operational-activity and personal-managerial scores rose by the same margin as informational scores, and the near-perfect inter-criterion correlation suggests that the components develop as one capacity rather than as separate skills. This supports the view of Mikhaylovskiy (2005), Volkovitskiy (2004) and Huntington (1957) that an officer's expertise and personal qualities form a single professional whole.

The mechanism is consistent with context-based and experiential learning. Following Verbitskiy (1991), the tasks moved cadets from studying content to acting in a model of future service: accepting a mission, assessing the situation, deciding, organising subordinates and checking results. Each cycle ended with analysis of the result and self-assessment, which corresponds to the reflective phase of Kolb's (2015) cycle. Simulator sessions let cadets repeat decisions and see their consequences without the cost and risk of field exercises, as Fletcher (2009) describes, and the tasks were designed around job competencies, as Salas and Cannon-Bowers (2001) recommend. The present results extend these arguments from technical and tactical skills to the duty-oriented personal qualities listed in Table 1.

The adaptive component built on the proposal of Skopylatov (1994) and Bogorev (1999) to group cadets by adaptivity. Diagnosis at the start, individual scenarios that differed in uncertainty and teacher support, adaptive testing and learning analytics gave each cadet tasks close to the upper limit of his current level. This is the core idea of technology-enhanced adaptive learning (Xie et al., 2019). In the model, however, the instructor kept control of scenario choice and debriefing. Reviews warn that many educational AI applications lack a pedagogical rationale and a clear role for the teacher (Zawacki-Richter et al., 2019), and UNESCO guidance asks that such systems serve defined educational goals (Miao et al., 2021). Keeping the instructor in the loop is especially important where the learning outcome includes command responsibility.

Limitations. First, the study was quasi-experimental: intact study groups were assigned to conditions, so unmeasured differences between groups cannot be fully excluded, although baseline equivalence on all criteria reduces this risk. Second, part of the assessment relied on questionnaires and on expert ratings by instructors and commanders who knew the group assignment, which may inflate scores. Third, the model was tested as a whole, so the separate contributions of the service-based tasks, the adaptive delivery and the simulator sessions remain unknown. Fourth, the sample came from three institutions in one national system, and the regulations are national. Generalisation to other armed forces should therefore concern the design principle (service-based tasks tied to regulatory requirements and adapted to cadets' profiles) rather than the specific content. Finally, readiness was measured at the end of training, not as performance in units after graduation.

6. Conclusion

This study shows that cadets' professional and personal readiness can be developed as a single pedagogical process in military higher education. An individualized adaptive learning model that builds tasks from service situations, ties them to the general military regulations and delivers them through individual scenarios, a digital learning environment and differentiated simulation raised all three criteria of readiness, with medium-to-large effects and no comparable

change in the control group. Readiness also proved to be an integrated capacity: its informational, operational-activity and personal-managerial components grew together.

Three practical recommendations follow for military education institutions:

1. Build practical tasks in tactical and professional courses from typical service situations, and link each task to the relevant requirement of the general military regulations and to the personal quality it develops, as in Table 1.
2. Diagnose cadets' adaptivity at the start of the course, assign them to typological groups, and give each group scenarios of suitable difficulty through an electronic course with adaptive tests and simulator sessions.
3. Assess readiness with the three criteria and three levels used here, together with the integral index, and use the results to adjust the scenarios during the course.

Further research should follow graduates into their first year of service, use blinded raters and randomised allocation where possible, and test the components of the model separately.

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DEVELOPING COGNITIVE COMPETENCES OF ACADEMIC LYCEUM STUDENTS THROUGH TRILINGUAL SOFTWARE IN MATHEMATICS: AN INTEGRATIVE APPROACH

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Abstract. *A trilingual (Uzbek–Russian–English) mathematics platform, used within an integrative teaching methodology, raised academic lyceum students' cognitive competence scores by 14.9% compared with conventional instruction. The study addresses the gap between national requirements for analytical, multilingual and digitally literate school leavers and classroom practice that is still dominated by reproductive tasks and monolingual materials. An integrative approach was adopted that unites four axes: mathematical content, three languages, digital software and cognitive operations. On this basis a web platform was developed for the Algebra course (20 lectures, 7 practical sessions, two 30-item tests and 5 interactive tasks in three languages), together with a four-stage teaching algorithm (analytical, organisational, activity-based and outcome stages). A quasi-experiment was conducted in five academic lyceums of Uzbekistan in 2021–2023 with 907 students (experimental group n = 453, control group n = 454). Cognitive competence was assessed by eight indicators grouped into three criteria. At baseline the groups did not differ (efficiency coefficient η = 0.997–1.001; Student's T = 0.00–0.17). After the intervention the experimental groups outperformed the control groups on every indicator (mean score 4.06–4.19 vs 3.54–3.62 on a 3–5 scale; T = 7.14–9.11, p < 0.05). The share of students at the high level rose from about 11% to 27–31%, while the share at the low level fell from about 60% to 15–18%. The findings suggest that trilingual software is effective when language, content and technology are designed as one system rather than added to one another.*

Keywords: *cognitive competence; trilingual education; educational software; integrative approach; mathematics education; academic lyceum; CLIL; Uzbekistan*

1. Introduction

Educational policy worldwide increasingly measures the quality of schooling by students' ability to analyse, compare, generalise and justify information and to transfer knowledge to new situations, rather than by the volume of facts they can reproduce. The Education 2030 Framework for Action places critical thinking and problem solving at the centre of quality education (UNESCO, 2016), and the OECD Learning Compass 2030 links competence to acting in multilingual and digital environments (OECD, 2019). The European key competence framework likewise lists multilingual and digital competence among the eight competences needed for lifelong learning (Council of the European Union, 2018).

Uzbekistan has translated these trends into national policy. Academic lyceums were reorganised in 2020 as institutions that select gifted students and prepare them for university study, with an intelligence test added to the admission procedure. Separate presidential resolutions set priorities for raising the quality of mathematics education (2020) and for popularising foreign-language learning (2021), and the "Digital Uzbekistan – 2030" strategy calls for digital educational

resources in the national language that are compatible with the international digital space. Taken together, these documents expect a lyceum graduate who thinks analytically, reads mathematics in more than one language and learns independently in a digital environment.

Classroom practice lags behind these expectations. Mathematics tasks in lyceums are still mostly pitched at the levels of remembering and applying; students rarely meet the Russian and English equivalents of the terms they learn in Uzbek, although olympiad materials and most online resources use those languages; and the available digital tools are either monolingual or not aligned with the national Algebra syllabus. Existing research treats the components of the problem separately: competence-based education, multilingual and CLIL pedagogy, and the design of digital learning environments. What is missing is a methodology that brings mathematical content, several languages, software and cognitive operations together.

The aim of this study was therefore to design a trilingual educational software and an integrative methodology for developing the cognitive competences of academic lyceum students in mathematics, and to test their effectiveness experimentally. Three research questions guided the work: (1) Which didactic possibilities does trilingual software offer for developing cognitive competence? (2) How should the software and the teaching methodology be designed so that language, content and technology work as one system? (3) Does the methodology produce statistically reliable gains compared with conventional teaching?

2. Theoretical framework

2.1. Cognitive competence

Weinert (2001) defines competence as the combination of knowledge, cognitive skills, motivation and social dispositions that enables a person to meet the demands of a situation; the definition implies that competence can be observed only when a learner faces a new task. Rychen and Salganik (2003) place the interactive use of language, symbols, information and technology in the first group of key competences, which means that language and digital tools are part of cognition rather than external aids. Khutorskoy (2003) distinguishes competence as a requirement from competency as its attained level, a distinction we use to separate the goals set by the model from the levels measured in the experiment.

Psychological theory explains how such competence develops. Lyceum students aged 15–17 are at the stage of formal operations and can work with hypotheses and abstract concepts (Piaget, 2001). Vygotsky (1978) shows that scientific concepts form through words within a system of instruction, and that learning is most effective within the zone of proximal development. Galperin's (1976) theory of the stage-by-stage formation of mental actions describes the path from a materialised action through external speech to an internal mental action. The revised Bloom taxonomy (Anderson & Krathwohl, 2001) orders cognitive processes from remembering to creating, while research on metacognition (Flavell, 1979; Pintrich, 2002) adds the ability to monitor and regulate one's own thinking. Krutetskii's (1968) analysis of mathematical abilities highlights generalisation, curtailment of reasoning and flexibility of thought.

Building on these sources, we define the cognitive competence of an academic lyceum student as an integrative quality formed in a digital learning environment that enables the student to perceive, analyse, compare, generalise and justify mathematical information in several languages, to transfer knowledge to new situations and to regulate his or her own cognitive activity reflectively. Five components follow from this definition: motivational-value, content-operational, linguo-cognitive, information-digital and reflective-metacognitive.

2.2. Multilingualism and cognition

Bilingual learners tend to show stronger executive control, because both languages remain active and the control system is constantly exercised in choosing between them (Bialystok, 2001; Bialystok, Craik, & Luk, 2012). Executive functions comprise updating, shifting and inhibition (Miyake et al., 2000) and continue to develop in adolescence (Diamond, 2013). In trilingual learners cross-linguistic influence runs in several directions, and the third language builds on the structures of the first two (Schroeder & Marian, 2017). Cummins' (1979, 2000) linguistic interdependence hypothesis holds that academic knowledge acquired in one language transfers to another through a common underlying proficiency, provided that the languages are deliberately connected in instruction. Cenoz and Gorter (2011) argue for treating languages as one multilingual repertoire, and translanguaging pedagogy legitimises the use of all of a learner's languages for understanding (García & Li Wei, 2014).

Content and Language Integrated Learning offers a model of how this can be organised: its 4Cs framework treats content, communication, cognition and culture as interdependent (Coyle, Hood, & Marsh, 2010), and its success depends on keeping content goals primary (Dalton-Puffer, 2011; Lasagabaster & Sierra, 2010). International experience with trilingual schooling in Kazakhstan (Mehisto, Kambatyrova, & Nurseitova, 2014) and the Basque Country (Cenoz, 2009) confirms that the first language must retain its status if additive rather than subtractive multilingualism is to be achieved (Baker, 2011).

2.3. Digital learning environments

Dual coding theory (Paivio, 1986) and the cognitive theory of multimedia learning (Mayer, 2020) show that words and pictures presented together, segmented and placed close to each other, lead to deeper learning. Cognitive load theory warns that split attention between separate sources overloads working memory (Sweller, 1988; Sweller, Ayres, & Kalyuga, 2011), and minimally guided discovery is ineffective for novices (Kirschner, Sweller, & Clark, 2006). Jonassen (2000) describes the computer as a mindtool that thinks with the learner, and Hattie (2009) identifies timely feedback as one of the strongest influences on achievement. In mathematics education, digital technology works when it is aligned with a didactic goal and does not hide the concept from the student (Drijvers, 2015).

2.4. The integrative approach

Theories of curriculum integration describe integration not as adding subjects together but as producing an integrated quality of knowledge (Berulava, 1993; Danilyuk, 2000). Fogarty (1991) describes ten models of integration, of which the "threaded" model, in which thinking skills run through all content, is closest to our purpose; Drake and Burns (2004) and Beane (1997) stress that integration requires a clearly defined unifying centre. The TPACK framework adds the technological dimension to content and pedagogy (Mishra & Koehler, 2006).

In this study the integrative approach is the leading methodological approach. We define it as a strategy that unites mathematical content, three languages (Uzbek, Russian, English), digital software and cognitive operations in one didactic system. Five arguments justify its leading role. First, cognitive competence is itself an integrative object. Second, trilingual software covers language, content and technology simultaneously. Third, knowledge transfers between languages only when the languages are deliberately connected (Cummins, 2000). Fourth, a single integrated environment prevents the split-attention effect that arises when text, translation and exercises live in separate places (Sweller et al., 2011). Fifth, the competence-based, activity-based, learner-

centred and systemic approaches each describe one side of the process and need a unifying framework. Figure 1 shows the four axes of integration.

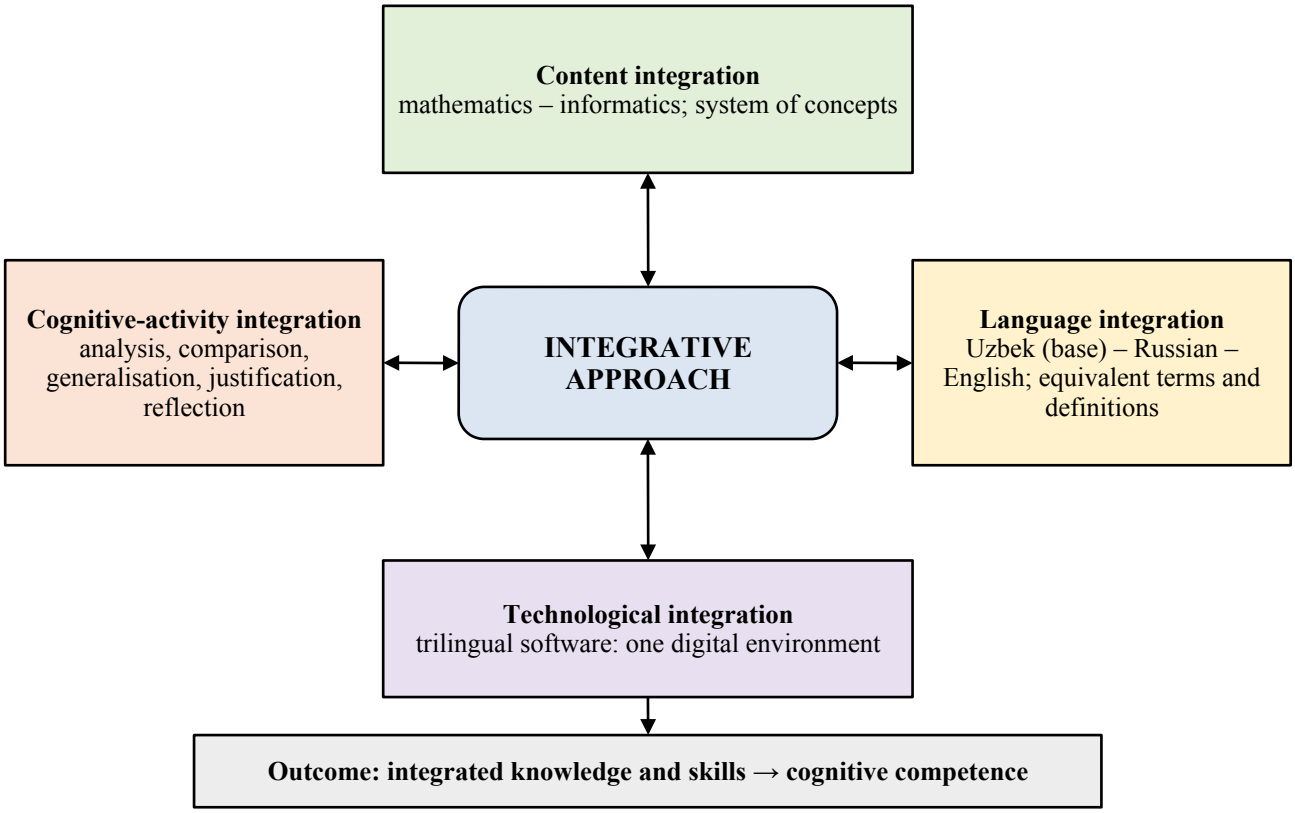


Figure 1. The four axes of the integrative approach to developing cognitive competence (author's design).

3. Materials and methods

3.1. The trilingual platform

The platform was developed through a seven-stage process that combines the ADDIE model of instructional design (Branch, 2009) with software engineering practice (Pressman, 2010): needs analysis, formulation of pedagogical requirements, content design, choice of architecture and technologies, development, testing and deployment, and pedagogical piloting. It is a web application written in TypeScript with the React library and the TanStack Start framework; mathematical notation is rendered with KaTeX. The 37 pages are pre-rendered as static HTML, so the platform runs on ordinary hosting and in any browser without installation. Its content and functions are summarised in Table 1.

Table 1. Content and functions of the trilingual platform

Section	Content	Main function
Learning resources	20 files: 10 PDF (Uzbek), 5 PPTX (Russian), 5 PPTX (English); search and format filter	Working with sources in several languages
Lectures	3 chapters, 20 topics: Number sets (7), Rational and irrational numbers (6), Algebraic expressions (7)	Systematic theory with rendered formulas
Practical sessions	7 topics of Chapter I (natural numbers, fundamental theorem of arithmetic, Euclidean algorithm, divisibility rules, Euler's function, division with remainder, last digit)	Independent practice (not auto-graded)

Section	Content	Main function
Video lessons	3 videos (absolute-value function, polyhedra, Ceva's theorem); titles in three languages	Visual explanation
Tests	2 tests × 30 items (Chapters I and II), uz/ru/en	Automatic scoring and item-level error analysis
Interactive tasks	5 tasks × 5 points: number patterns, percentages with a chart, binary numbers, finding an algorithm error, comparing purchase options	Modelling, hypothesis testing, feedback
Methodological guidance	8 recommendations for teachers	Lesson planning

Each content field stores an Uzbek text and optional Russian and English versions. The text shown for the selected language λ is chosen by a fallback rule, so the student never meets an empty page:

$$show(L,\lambda)=\begin{cases} L_{\lambda}, if\ the\ text \in language\ \lambda\ \exists; \\ L_{uz}, otherwise. \end{cases} \quad (1)$$

Test results are calculated as P = round(100·k/n)%, where k is the number of correct answers out of n; scores of 85% or more are rated excellent and scores below 50% trigger a recommendation to revisit the topic. Each interactive task is scored as B = round(5·k/m), where k of m fields are correct. After a test, every question is shown with the correct and incorrect answers marked, and the best result is stored in the browser. Machine translation was deliberately avoided: all three language versions were prepared in advance so that mathematical terms remain precise (for example, the Uzbek "taqqoslama" corresponds to "congruence", not "comparison"). The platform stores results only in the user's browser and has no central gradebook; for this reason the platform scores served as feedback for students, while competence levels in the experiment were measured with separate instruments.

3.2. Model and teaching methodology

The model has five blocks: a target block (social demand, goal and tasks), a theoretical-methodological block (the integrative approach as the leading approach, and six principles: linguo-cognitive harmony, priority of the base language, cognitive gradation, prompt feedback, reflectivity and multimodality), a content block (the Algebra and Geometry content and six types of cognitive competence: research, communicative, imitative, psychological, activity and reflective), an organisational-technological block (four teaching stages, forms, methods and the platform) and an outcome-diagnostic block (criteria, indicators and levels).

Every topic was taught through a four-stage algorithm. In the analytical stage the key concepts were introduced in Uzbek and then linked to their Russian and English equivalents. In the organisational stage students were assigned cognitive roles (analyst, interpreter, checker) and planned the solution. In the activity stage they applied knowledge through practical sessions, videos and interactive tasks, tested hypotheses and justified solutions in one of the three languages. In the outcome stage they took the test, analysed their errors and planned the next step; a test score below 85% sent the student back to the relevant lecture or practical session. Table 2 lists the methods used.

Table 2. Methods of the trilingual methodology

Group	Method	Description

Linguo-cognitive	Trilingual term chain	Terms are lined up in Uzbek, Russian and English and their inner meanings compared to isolate the essential feature of the concept
	Restore the definition	A definition given in one language is transferred to another and its essential features checked
Problem-search	Find the pattern	A pattern is found in a sequence, expressed as a general formula and verified on the platform
	Catch the error	An error planted in a solution or algorithm is located, explained and corrected
Interactive-digital	Bit constructor	Binary place values are switched on and off to build a number while its decimal value is observed
	Digital debate	Groups justify the solution of an applied problem in different languages and restate each other's arguments
Reflective	Three-step reflection	After each test: What did I learn? Where did I err? What will I do next time?
	Error diary	Errors are logged by type to reveal recurring mistakes

For example, in the "Number patterns" task students receive the sequence 2, 6, 12, 20, 30, … and must find its 6th, 7th and 10th terms. Noticing that the differences 4, 6, 8, 10 form an arithmetic progression and rewriting the terms as 1·2, 2·3, 3·4, … they arrive at $a_n = n(n + 1)$ and check $a_6 = 42$, $a_7 = 56$ and $a_{10} = 110$ on the platform. The task moves the student from observation to hypothesis and verification, in line with Polya's (1945) problem-solving stages.

3.3. Participants and design

A quasi-experiment with non-equivalent groups and pre- and post-tests was carried out in the 2021–2022 and 2022–2023 academic years in five academic lyceums: the S.H. Sirojiddinov Republican Academic Lyceum, the "Sayiljoy" Academic Lyceum of Jizzakh State Pedagogical Institute, the Academic Lyceum of Nizami Tashkent State Pedagogical University, the Academic Lyceum of Tashkent Institute of Textile and Light Industry and the Academic Lyceum of Karshi Engineering-Economics Institute. Existing class groups with the same study profile and similar initial results were assigned to the experimental (EG) or control (CG) condition. In total 907 students took part: 453 in 2021–2022 (EG 227, CG 226) and 454 in 2022–2023 (EG 226, CG 228). The EG studied with the platform-based methodology; the CG studied the same topics in the same number of hours with the standard textbooks and conventional methods.

3.4. Instruments and criteria

Cognitive competence was assessed with eight indicators grouped into three criteria (Table 3). Results on each indicator were obtained from diagnostic tests, trilingual terminology tasks, practical-research tasks, lesson observation, expert evaluation, reflection sheets and questionnaires, combined into a 100-point score and assigned to one of three levels: high (86–100 points, $x_i = 5$), medium (71–85, $x_i = 4$) and low (70 or below, $x_i = 3$).

Table 3. Criteria and indicators of cognitive competence

Criterion	Indicators	Instruments
Cognitive-content	(1) understands the essence of the systemic model of cognitive competence; (2) knows and	Diagnostic test, trilingual terminology task,

Criterion	Indicators	Instruments
	distinguishes the types of cognitive competence and their components	interview
Linguo-cognitive-activity	Understands and shows the (3) research, (4) communicative, (5) imitative and (7) activity types: finding and justifying patterns, expressing ideas in three languages, transferring algorithms, applying knowledge	Practical-research tasks, lesson observation, expert evaluation
Reflective-psychological	Shows the (6) psychological type (motivation, attitude to errors) and (8) reflective type (identifying errors and changing strategy)	Reflection sheets, error diary, questionnaire, self-assessment

3.5. Statistical analysis

The data were processed following Grabar and Krasnyanskaya (1977) and Sidorenko (2003). For each group the mean score, the sample variance and the efficiency coefficient were calculated:

$$\overline{X}=\frac{1}{N}\sum_{i=1}^{3} m_i x_i,\ S^2=\frac{1}{N}\sum_{i=1}^{3} m_i\left(x_i-\overline{X}\right)^2,\ \eta=\frac{\overline{X}_E}{\overline{X}_C} \tag{2}$$

where x_i is the score level, m_i the number of students at that level, N the group size and $\eta > 1$ means that the EG outperformed the CG; $(\eta - 1)\cdot 100\%$ expresses the gain in percent. Differences between means were tested with Student's T statistic, with Welch's degrees of freedom:

$$T=\frac{\left|\overline{X}_E-\overline{X}_C\right|}{\sqrt{\frac{S_E^2}{N_E}+\frac{S_C^2}{N_C}}} \tag{3}$$

The null hypothesis H_0 (no difference between group means) was rejected in favour of H_1 when T exceeded the critical value $T_{0\cdot 95}(k)$. With $k \geq 68$ in every comparison the critical value lies between 1.96 and 2.00; 1.96 is reported, and all post-test values were well above both bounds. The 95% confidence intervals of the means were also compared.

4. Results

4.1. Baseline equivalence

Before the intervention the groups were equivalent. Across the three criteria about 60% of students in both groups were at the low level, 28–30% at the medium level and only 11–12% at the high level. The mean scores of the EG and CG ranged from 3.45 to 3.54, the efficiency coefficient from 0.997 to 1.001, and Student's T from 0.00 to 0.17, far below the critical value; the confidence intervals overlapped completely. H_0 was therefore accepted for all eight indicators in both academic years.

4.2. Post-test results

After one year of instruction the EG outperformed the CG on every indicator in both years. The EG mean ranged from 4.06 to 4.19 and the CG mean from 3.54 to 3.62; η ranged from 1.131 to 1.162, and T from 7.14 to 9.11, so H_1 was accepted in all 16 comparisons. Table 4 shows how the distribution of levels changed by criterion.

Table 4. Share of students at the high and low levels before and after the intervention, by criterion (%, both years pooled)

Criterion	Group	High, pre	Low, pre	High, post	Low, post
Cognitive-content	EG	11.5	60.9	27.3	15.3
	CG	10.8	60.4	13.2	56.1
Linguo-cognitive-activity	EG	11.4	60.8	27.8	17.5
	CG	11.3	60.4	14.6	55.2
Reflective-psychological	EG	11.9	60.0	30.5	15.6
	CG	11.2	58.7	14.8	54.1

In the EG the share of students at the high level more than doubled on every criterion, and the share at the low level fell to 15–18%. In the CG the high-level share rose by only 2–4 percentage points and more than half of the students remained at the low level. The largest gain was observed on the reflective-psychological criterion ($\eta = 1.150$) and on the cognitive-content criterion ($\eta = 1.153$); the linguo-cognitive-activity criterion, which includes hypothesis formation and proof, showed a smaller but still reliable gain ($\eta = 1.142$).

4.3. Results by teaching stage

Results were also recorded for each of the four teaching stages in all five lyceums. Table 5 gives the statistics pooled over both years; Figure 2 shows the efficiency coefficient.

Table 5. Results by teaching stage, all five lyceums, 2021–2023 (EG n = 453, CG n = 454)

Stage	EG mean	EG SD	CG mean	CG SD	η	T	Decision
Analytical	4.03	0.66	3.51	0.69	1.146	11.51	H_1
Organisational	4.01	0.66	3.49	0.69	1.147	11.52	H_1
Activity	4.02	0.65	3.49	0.68	1.153	12.02	H_1
Outcome	4.02	0.66	3.50	0.69	1.149	11.67	H_1

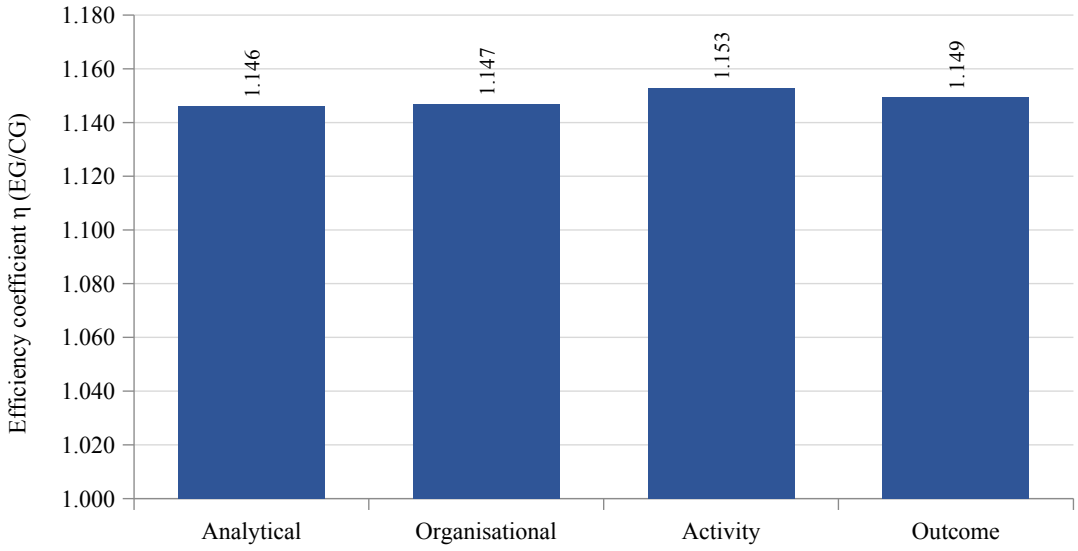


Figure 2. Efficiency coefficient η of the experimental over the control groups by teaching stage, five lyceums, 2021–2023 (η > 1 favours the experimental group).

The efficiency coefficient was stable across stages (1.146–1.153) and peaked in the activity stage, where the interactive tasks and problem-search methods were used most intensively. The mean of the four stage coefficients is $\bar{\eta} = 1.149$, which corresponds to a 14.9% higher outcome in the EG. At the level of individual lyceums and years, η ranged from 1.141 to 1.161, and every comparison yielded $T \geq 3.41$, so the effect was reproduced in each institution.

5. Discussion

The results answer the three research questions. First, trilingual software offers content, linguo-cognitive, methodological, technological and evaluative-reflective possibilities for developing cognitive competence; its central contribution is that one concept appears in three languages, with formulas and an interactive check, on one screen. Second, these possibilities are realised only when the software and the methodology are designed together around a unifying centre, which in this study was the chain of cognitive operations. Third, the integrative methodology produced statistically reliable gains of about 15% over conventional teaching, reproduced across two academic years and five institutions.

The strongest effect on the reflective-psychological criterion is consistent with research that identifies feedback as a key driver of achievement (Hattie, 2009) and with models of self-regulated learning in which students plan, perform and reflect in cycles (Zimmerman, 2002). The platform's immediate error analysis, the retention of the best result and the possibility of retrying made errors a normal part of learning rather than a penalty. The gain on the cognitive-content criterion supports Cummins' (2000) view that comparing languages around one concept helps students separate the concept from its verbal form: comparing "prime", "простое" (simple) and "tub" (root) draws attention to three different aspects of the same idea.

The smaller gain on the linguo-cognitive-activity criterion is to be expected. Forming and proving hypotheses are the most demanding operations, and Halpern (2014) notes that such higher-order skills develop only through repeated, deliberately structured practice. The finding also agrees with the warning that minimally guided discovery is ineffective (Kirschner et al., 2006): in our methodology hints and step-by-step solutions were built into every task.

The study is consistent with international experience of trilingual education, which shows that the first language must keep its status (Baker, 2011; Mehisto et al., 2014). In our design Uzbek remained the base language: new concepts were always introduced in Uzbek and the fallback rule guaranteed Uzbek text wherever a translation was missing. The study adds to that literature a software-centred model in which the platform, rather than the teacher alone, carries the parallel trilingual content.

Several limitations should be noted. The design was quasi-experimental with intact class groups, so pre-existing class differences cannot be fully excluded, although baseline equivalence was confirmed statistically. Because the platform stores data only in the browser, usage data such as the number of attempts and time on task were not collected, and the mechanism of the effect could not be analysed in detail. The intervention covered only Algebra and Geometry; practical sessions on the platform exist only for the first chapter, and there is no test for the third chapter yet. Finally, the efficiency coefficient expresses a ratio of means; standardised effect sizes should be reported in future studies.

6. Conclusion

Trilingual educational software becomes an effective tool for developing the cognitive competence of academic lyceum students when it is designed within an integrative approach that unites mathematical content, three languages, digital technology and cognitive operations. The

platform and the four-stage methodology described here raised the share of high-level students from about 11% to 27–31% and gave a 14.9% higher outcome than conventional instruction, with statistically reliable differences on all indicators.

We recommend that trilingual terminology lists and platform-based lesson guidelines be included in the teaching materials for Algebra and Geometry in academic lyceums, and that a module on teaching in trilingual digital environments be added to in-service training for mathematics teachers. Future work should add a teacher dashboard and learning analytics to the platform, extend it to the remaining chapters, and test the methodology in physics and computer science.

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BEYOND SHARED RUBRICS: OPPORTUNITY-SENSITIVE VALIDATION OF STUDENT TEACHERS' MANAGEMENT CULTURE

Abduvaliyev Adxamjon Ismoilovich

Abstract. *Shared rubrics can make expectations visible without establishing that assessment scores represent comparable professional capabilities. This conceptual study examines that distinction in the assessment of student teachers' management culture. Through theory adaptation and purposive synthesis of published scholarship, the study connects argument-based validity, workplace assessment, and formative assessment. The central argument is that credible interpretation requires evidence about both the corroboration of professional judgments and students' opportunities to demonstrate the assessed capability. A shared score can otherwise conceal differences in placement access, assessor expectations, and reflective writing proficiency. The article develops an opportunity-sensitive evidence model, distinguishes productive assessor disagreement from scoring inconsistency, and specifies a validation agenda separating developmental feedback from consequential decisions. An analytical table and an original conceptual evidence-space figure make these distinctions operational without assigning unsupported numerical thresholds. The contribution is a bounded extension of existing validity theory, not a validated instrument or an empirical demonstration of improved performance. Its practical implication is to standardize the justification of judgments while preserving defensible contextual variation.*

Keywords: *teacher education, management culture, assessment validity, placement opportunity, evaluative judgment.*

Introduction

A university lecturer and a placement mentor may use the same rubric yet evaluate different accomplishments. One observes the student's explanation of a classroom decision; the other observes its enactment under time pressure. Agreement between their ratings might reflect shared understanding, but it might also reflect deference, restricted evidence, or similar expectations. Disagreement is equally ambiguous. It may expose inconsistent scoring or reveal a genuine difference between articulated reasoning and situated performance. The assessment problem is therefore not resolved by distributing one form.

Published research provides good reasons to use explicit criteria while questioning what they can establish. Rubric reviews distinguish improved scoring consistency from justified interpretations of capability (Jonsson & Svingby, 2007; Panadero & Jonsson, 2013). Workplace assessment scholarship emphasizes that performance and its interpretation depend on context (Govaerts & van der Vleuten, 2013). Read together, these positions reveal a problem that deserves explicit attention in teacher education: an assessment can be transparent at the level of descriptors while remaining opaque about the opportunities from which its evidence arose. The educational premise is straightforward: knowing how to describe management is not equivalent to managing responsibly.

The present research asks: Under what conditions can a shared rubric support defensible judgments about student teachers' management culture across unequal placement opportunities?

The thesis is that shared criteria require a complementary opportunity-sensitive validity argument. Evidence must establish not only what assessors saw and how they interpreted it, but also whether the student could reasonably have demonstrated the relevant capability. The contribution is an interpretive model integrating those requirements, rather than a replacement inventory of competencies. It develops a distinction between standardizing assessment language and standardizing the evidential warrant for decisions.

Critical Literature Review

Management culture is used here as a proposed analytical construct encompassing accountable professional judgment, attention to pupils' interests, communication, and reflection. This working definition is not presented as an established measurement scale. It concerns the reasons and relationships through which professional action becomes educationally defensible, rather than administrative efficiency alone. Planning, learning environments, parental cooperation, collegial work, and professional development are possible settings for examining it, not presumed latent dimensions. Distinguishing settings from performance qualities avoids treating a curriculum map as evidence that all observations can be combined into one meaningful total.

Activity theory and organizational culture scholarship clarify this distinction. Leontyev's (1975) account places activity within relations among motives, objects, and conditions; isolated behavioral verbs cannot carry that entire explanatory burden. Schein (2010) distinguishes visible artifacts from espoused values and underlying assumptions. Consequently, a student's respectful speech is evidence relevant to communication, but not direct access to an enduring cultural assumption. Calling an assessment "cultural" should increase attention to interpretation rather than license stronger dispositional conclusions.

Validity scholarship supplies the missing inferential discipline. Messick (1995) connects score meaning with construct representation and consequences. Kane (2013) makes the burden claim-specific: interpreting observed performance, generalizing beyond it, and authorizing a consequential use require distinguishable support. The Standards for Educational and Psychological Testing similarly locate fairness within defensible interpretation and use (American Educational Research Association et al., 2014). These positions challenge the idea that an intuitively appropriate descriptor validates every application of its score.

Rubric research offers qualified rather than unconditional support. Jonsson and Svingby's (2007) review identifies benefits for reliable scoring, particularly with analytic criteria, exemplars, and assessor preparation, but rejects validity by rubric alone. Panadero and Jonsson (2013) likewise identify formative potential moderated by implementation. The relevant contrast is not rubrics versus professional judgment. It is unsupported judgment versus judgment made inspectable through criteria, evidence, and reasons.

A second tension concerns learning. Sadler (1989) requires learners to understand quality, compare current work with it, and act to close the gap. Hattie and Timperley (2007) show why feedback must be examined in relation to its focus and use, not merely its delivery. Carless and Boud (2018) add the learner's capacity to interpret and use feedback, while Tai et al. (2018) foreground evaluative judgment. Schön's (1983) reflection-in-action further cautions against equating professional reflection with polished retrospective prose. Workplace assessment scholarship makes context and interpretation central rather than residual nuisances (Govaerts & van der Vleuten, 2013). Together, these literatures expose an unresolved relationship: the same shared rubric may scaffold learning while remaining insufficient for cross-placement certification.

Methodology

The design is a conceptual theory adaptation, following Jaakkola's (2020) requirement to specify the role of theory in nonempirical inquiry. Argument-based validity provides the organizing framework; workplace assessment and formative assessment supply complementary accounts of context and learning. The unit of analysis is an assessment claim and its implied evidential warrant, rather than a participant, school, or score.

Analysis proceeded through three operations. First, the synthesis distinguished shared criteria, observed performance, score interpretation, and decision use as separate objects requiring explanation. Second, potential inferences were interrogated through scoring, generalization, contextual interpretation, and decision consequences, drawing on Kane (2013). Third, tensions between comparability and formative usefulness were synthesized into an evidence model. Alternative explanations—including assessor convergence, writing development, and unequal access to tasks—were used as conceptual counterexamples, not treated as observed causes.

Published literature was selected purposively for direct relevance to validity, rubric use, workplace judgment, reflection, and feedback. Bibliographic details and available DOIs were checked against publisher records, scholarly indexes, and library catalogues. The corpus comprises 14 published scholarly works; it is neither an exhaustive systematic review nor a meta-analysis.

No participant data were collected or reconstructed, and no assessment improvements are reported as study findings. The outputs are analytic distinctions, design propositions, a table, and a conceptual figure. Illustrative scenarios are explicitly hypothetical. No numerical chart is supplied because this design provides no commensurable numerical dataset addressing the research question.

Analysis: From Observable Indicators to Defensible Inferences

Observable descriptors can specify what assessors should attend to. A criterion such as "justifies a management decision" is more inspectable than a general demand for professional maturity. Yet its meaning depends on what counts as a relevant reason, which alternatives were available, and whether the explanation corresponds to action. Rubric reviews support the value of explicit criteria while showing why descriptor design alone is insufficient to establish validity (Jonsson & Svingby, 2007; Panadero & Jonsson, 2013). The analytical task is therefore to identify the additional warrants needed between an observed instance and an interpretation of professional capability.

At least three warrants require separate scrutiny. A scoring warrant links evidence to a performance level and requires interpretable descriptors and appropriate assessor preparation. A generalization warrant asks whether another task, occasion, or observer would support the intended claim. A decision warrant concerns the consequences of acting on the interpretation, including certification or remediation (Kane, 2013). None follows automatically from the others. Consistent scoring of an overly narrow task can underrepresent capability, while a rich narrative can remain insufficiently comparable for ranking. Likewise, organizing observations into broad categories does not establish that those categories constitute distinct measurement dimensions. Aggregation requires substantive justification about weighting, compensation, and the meaning of the resulting total. These distinctions prevent a practical assessment form from acquiring stronger interpretive authority than its evidence supports.

A more consequential ambiguity concerns opportunity. A student assigned to a placement that excludes trainees from parent meetings cannot demonstrate parental cooperation in the same way as a student invited to lead one. This hypothetical counterexample shows why nonobservation cannot automatically become a low score. Conversely, counting attendance as competence would

reward access rather than quality. Opportunity should therefore be recorded separately from performance, including task access, responsibility, assistance, and situational constraints. Such information conditions an inference; it is not an automatic adjustment granting higher marks.

Table 1 translates these inferential concerns into an assessment audit. It separates what a performance indicator can contribute from the inference it cannot establish alone. The proposed safeguards are design implications derived from the theoretical synthesis, not tested procedures or reported outcomes.

Table 1

An Inferential Audit of Management Culture Assessment

Assessment focus	Inferential vulnerability	Evidence or safeguard proposed
Decision justification	Persuasive explanation may not match enacted choice.	Link reasons to an observed episode; examine a later decision.
Pupils' interests	Adult agreement may mask an unexamined value judgment.	State the educational interest, competing considerations, and evidence.
Communication	Prestige language or confidence may substitute for responsiveness.	Assess task-relevant understanding across suitable evidence modes.
Reflection	Fluent retrospective writing may overstate adaptive capability.	Compare reflection with subsequent action; avoid equating length with depth.
Cross-placement comparison	Absent access may be scored as deficient capability.	Record access, responsibility, assistance, and constraints separately.
Assessor agreement	Consensus may conceal dependence or shared bias.	Retain independent reasons; adjudicate before averaging.

Note. Original analytical synthesis informed by Kane (2013), Jonsson and Svingby (2007), Govaerts and van der Vleuten (2013), and the other published literature discussed in the text. Safeguards are proposals, not validated interventions.

An Opportunity-Sensitive Evidence Model

The proposed model distinguishes two qualitative dimensions: evidential corroboration and opportunity comparability. Corroboration concerns whether observations, artifacts, and reasoned assessor accounts support the same bounded interpretation. Opportunity comparability concerns whether students encountered sufficiently relevant conditions to support the intended comparison. Neither dimension is reducible to the number of forms collected. Several assessors repeating the same undocumented impression provide weaker corroboration than independent accounts that identify their evidence and limits.

Figure 1 places these dimensions in a conceptual evidence space. The upper-left region is especially important: convergent positive judgments can remain unsuitable for ranking when opportunities differ materially. The lower-right region exposes the opposite problem: equal tasks do not rescue thin or contradictory evidence. In the upper-right region, a broader interpretation becomes more defensible, but certification still requires an explicit decision rule and an

examination of consequences. The boundaries are deliberately unscaled because no empirical calibration supports numerical cutoffs.

This arrangement makes missing opportunity and weak performance analytically distinguishable without treating either as harmless. Missing access calls for an alternative demonstration, a narrower claim, or deferred judgment. Weak performance observed under adequate conditions calls for feedback and another appropriately supported opportunity. Institutions should document which response follows which diagnosis. Otherwise, "context sensitivity" can become an opaque exception process favoring confident students or influential mentors.

Assessor disagreement should be investigated before it is averaged away. A lecturer may rate decision justification highly while a mentor questions implementation. If both accounts are well evidenced, their disagreement identifies a capability boundary useful for teaching. If they rated the same recorded episode but applied different meanings to a descriptor, calibration is needed. The first case calls for differentiated interpretation; the second calls for scoring repair. The model therefore standardizes the demand for reasons rather than demanding uniform ratings regardless of evidence.

Figure 1

A Conceptual Evidence Space for Opportunity-Sensitive Interpretation



Note. Regions indicate qualitative distinctions, not measured scores, frequencies, validated thresholds, or a causal surface. Placement within the space requires a reasoned evidential account. Original synthesis informed by Kane (2013), Govaerts and van der Vleuten (2013), and American Educational Research Association et al. (2014).

Discussion and Theoretical Implications

The argument yields three propositions for future testing. First, adding opportunity records should improve the defensibility of explanations for missing or low evidence, although whether it reduces unfair decisions remains an empirical question. Second, structured adjudication should distinguish evidential disagreement from descriptor ambiguity more effectively than immediate score averaging. Third, reflective performance should show stronger professional relevance when changes in subsequent decisions corroborate written reflection than when writing is assessed alone. These are falsifiable expectations, not findings.

An important theoretical implication is that management culture should initially be treated as a situated profile of accountable judgment. A single total may conceal ethically significant contrasts: sophisticated justification cannot necessarily compensate for disregard of pupils' interests. Equal weighting, compensation, and minimum standards are substantive policy choices, not arithmetic conveniences. The literature on validity supports examining such consequences; it does not prescribe a universal weighting system (Kane, 2013; Messick, 1995). Profile reporting can preserve these distinctions while local research investigates whether aggregation serves any defensible purpose.

The formative–summative distinction also needs institutional expression. During learning, provisional judgments and supported rehearsal may be appropriate. Certification demands an auditable evidential threshold and a fair opportunity to respond to adverse judgments. Treating every reflective admission as evidence for a final grade could discourage candor; this is a design risk rather than an effect demonstrated here. Feedback literacy and evaluative judgment offer reasons to involve students in interpreting evidence without making self-ratings interchangeable with independent observation (Carless & Boud, 2018; Tai et al., 2018).

Validation should begin with a modest pilot rather than immediate large-scale scoring. Annotated performance examples can test whether assessors distinguish levels as intended. Independent ratings followed by documented discussion can reveal ambiguity. Repeated episodes across domains can examine stability and contextual boundaries. Where sample structure permits, analyses should separate variation associated with students, assessors, tasks, and placements, rather than report one agreement coefficient as sufficient proof. Interviews can investigate how pupils' interests are interpreted and whether students experience access barriers. These are complementary sources of evidence, consistent with the contextual orientation of Govaerts and van der Vleuten (2013).

For multilingual settings, the proposal carries a further qualification. Reflective writing may draw simultaneously on professional insight and proficiency in the assessment language. Institutions should investigate that possible confounding through matched oral, written, and action-based evidence rather than assume equivalence. Nor should "communication culture" mean conformity to one prestigious speaking style. Descriptors need to identify respectful responsiveness and task-relevant understanding while allowing defensible linguistic variation. The fairness principles in the testing Standards support this scrutiny, but local evidence must determine which accommodations preserve the intended construct (American Educational Research Association et al., 2014).

Theoretical foundations and validation evidence perform different explanatory jobs. Developmental and organizational theories can motivate the qualities worth attending to, but they do not demonstrate that a particular score captures them. Leontyev (1975) and Schein (2010) help explain why action must be interpreted within activity and culture; assessment scholarship specifies the additional evidential demands attached to judgments about that action. The

contribution lies in making these demands jointly explicit. Its scope is the interpretation of professional performance, not a claim to have discovered a new universal structure of teacher competence.

A further distinction concerns whose interests define successful management. An orderly lesson may satisfy a mentor while limiting pupils' participation; a participatory activity may appear less orderly while serving a defensible learning purpose. These contrasts are hypothetical, not reported observations. They show why the pupil-interest indicator needs explicit reasons and appropriate evidence rather than a reassuring label. Student accounts, task artifacts, and ethically obtained pupil perspectives could inform interpretation, but each has limitations and must be proportionate to the assessment purpose. Institutional authorization and safeguards would be required before collecting pupil data. The objective is not to make every stakeholder an interchangeable rater. It is to expose the warrant linking a managerial action to the educational interest invoked in its defense. This requirement also prevents professional confidence from standing in for ethical adequacy.

Research Limitations

The model has not been implemented or empirically validated. Its two dimensions are analytic distinctions, and their separability in actual assessor reasoning is unknown. Purposive source selection favors established conceptual and review literature over comprehensive coverage; recent empirical work or locally published studies may alter the proposed relationships. Evidence from medical workplace assessment is transferred as an interpretive resource, not as direct proof about teacher education.

The construct also requires contextual refinement. "Management culture" may not carry equivalent meanings across institutions, professional traditions, or assessment languages. No claim is made about the prevalence of the identified problems in Uzbekistan or elsewhere. Proposed opportunity records could increase workload and reproduce bureaucracy unless their informational value is tested. A validation study must examine these normative differences, documentation burden, and unintended consequences alongside technical adequacy. Empirical evaluation should therefore investigate whether the model improves actual decisions, not merely whether assessors find its terminology appealing.

Conclusion

Observable indicators make professional expectations discussable; they do not make every resulting judgment comparable. Published validity, rubric, and workplace assessment scholarship supports distinguishing transparent criteria from defensible interpretation. Their synthesis yields a bounded conceptual contribution: performance evidence should be interpreted jointly with its corroboration and the opportunity under which it was produced. Neither agreement alone nor an identical task guarantees a justified consequential decision.

The proposed model preserves the educational value of shared criteria without confusing shared language with shared evidence. It directs institutions to record opportunity, investigate disagreement, seek evidence beyond reflective prose, and justify consequential decisions separately from developmental feedback. Its value now depends on empirical challenge, including tests of whether these safeguards improve interpretation without creating disproportionate administrative burden.

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DEVELOPING 8TH GRADE LEARNERS' CRITICAL THINKING THROUGH MEDIA LITERACY AND EVALUATION OF ONLINE INFORMATION IN ENGLISH LESSONS

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Abstract. *The article examines the possibilities of developing 8th grade learners' critical thinking through media literacy and the evaluation of online information in English lessons. Teenagers spend a considerable part of their time online and are constantly exposed to information of varying reliability, including misinformation, manipulative advertising and unverified content on social media, much of which is in English. The article analyses the relationship between critical thinking and media literacy on the basis of the works of R. Ennis, P. Facione, D. Buckingham, R. Hobbs, W.J. Potter and A.V. Fedorov, as well as the concept of information disorder proposed by C. Wardle and H. Derakhshan. Research by S. Wineburg, S. McGrew and colleagues on civic online reasoning and lateral reading is discussed as evidence that young people need explicit instruction in evaluating digital sources. The article proposes a step-by-step framework for evaluating online information adapted for 8th grade English learners – identifying the source, checking the evidence, reading laterally, distinguishing facts from opinions and recognising persuasive techniques – and describes classroom tasks for each step. It is argued that the English lesson, where learners work with authentic texts in English, provides a natural context for integrating media literacy and developing critical thinking.*

Keywords: *critical thinking, media literacy, information literacy, evaluation of online information, misinformation, lateral reading, fact and opinion, persuasive techniques, English lessons, 8th grade learners*

Introduction. Today's teenagers live in a world saturated with information. They spend a considerable part of their time on social networks, video platforms and websites, where they encounter news, advertisements, opinions, rumours and deliberately misleading content. Much of this information is in English, the dominant language of the internet. The ability to evaluate the reliability of information, to distinguish facts from opinions and to recognise manipulation has therefore become a vital life skill and an essential component of critical thinking.

The importance of developing learners' ability to work with information is reflected in international and national educational documents. The PISA 2018 reading framework includes evaluating the quality and credibility of information and detecting and handling conflict between sources as key reading processes [1]. UNESCO emphasises media and information literacy as a set of competences that enable citizens to think critically about information and use it responsibly [2]. The Law of the Republic of Uzbekistan "On Education" defines the development of learners' competences needed in modern life as one of the main tasks of education [3].

However, in English lessons at secondary school, texts are usually used primarily as material for developing reading skills and learning vocabulary, while questions about who created

the text, for what purpose and how reliable it is are rarely discussed. This article aims to show how media literacy and the evaluation of online information can be integrated into English lessons in the 8th grade as a means of developing learners' critical thinking.

Critical thinking and media literacy. Critical thinking has been defined by R. Ennis [4] as reasonable reflective thinking focused on deciding what to believe or do, and by the expert panel led by P. Facione [5] as purposeful, self-regulatory judgement that includes interpretation, analysis, evaluation and inference. D. Halpern [6] emphasises that critical thinking skills include the ability to analyse arguments, evaluate the credibility of sources and recognise errors in reasoning. These definitions show that the evaluation of information is at the very core of critical thinking.

Media literacy extends critical thinking to the analysis of media messages. D. Buckingham [7] defines media education as the process of teaching and learning about media, which aims to develop both critical understanding and active participation. R. Hobbs [8] describes digital and media literacy as a set of competences that include accessing information, analysing and evaluating messages, creating content, reflecting on one's own conduct and taking action. W.J. Potter [9] proposed a cognitive theory of media literacy, emphasising that media literate individuals actively interpret media messages using knowledge structures and are aware of the influence of media on them. In the Russian tradition, A.V. Fedorov [10] has developed the theory and methodology of media education, stressing the formation of critical thinking in relation to media texts as one of its main aims.

An important concept for understanding the modern information environment is "information disorder", proposed by C. Wardle and H. Derakhshan [11]. They distinguish three types of problematic information: misinformation (false information shared without intent to harm), disinformation (false information deliberately created to harm) and malinformation (genuine information shared to cause harm). Understanding these distinctions helps learners realise that false information is not always created deliberately and that they themselves may unintentionally spread it.

Why young people need explicit instruction. It is often assumed that young people, as "digital natives", are skilled at evaluating online information. Research, however, shows otherwise. S. McGrew, S. Wineburg and colleagues [12], in a series of assessments of "civic online reasoning", found that many students were unable to distinguish advertisements from news articles, judged the credibility of websites by their appearance and failed to investigate who was behind the information. A later national study by J. Breakstone and colleagues [13] confirmed that the majority of secondary school students struggled to evaluate online sources. S. Wineburg and S. McGrew [14] showed that professional fact-checkers use a strategy called "lateral reading": instead of reading a website carefully from top to bottom, they leave it quickly and open other tabs to find out what other sources say about the website and its claims. This strategy proved much more effective than the checklists traditionally taught in schools.

For 8th grade learners (13–14 years old), this problem is particularly relevant. On the one hand, adolescents develop the capacity for abstract and hypothetical reasoning, which, according to B. Inhelder and J. Piaget [15], makes it possible to analyse and evaluate information systematically. On the other hand, they are very active users of social media, tend to trust information shared by peers and are often influenced by emotional and visually attractive content. This makes the 8th grade an appropriate stage for explicit instruction in evaluating information.

A framework for evaluating online information in English lessons. Based on the research discussed above, we propose a five-step framework for evaluating online information adapted for 8th grade English learners. The framework combines elements of traditional source evaluation with the lateral reading strategy and can be practised with authentic English texts: news items, blog posts, advertisements, social media posts and short videos. Table 1 presents the steps, the key questions learners ask and examples of classroom tasks.

Table 1. A framework for evaluating online information in English lessons

Step	Key questions (in English)	Examples of classroom tasks
1. Identify the source	Who created this? What is their purpose – to inform, to persuade, to sell or to entertain?	Matching texts with their purposes; identifying the author, website and date of short online texts
2. Check the evidence	What evidence is given? Are there facts, numbers, quotes or links? Is the evidence relevant?	Highlighting claims and evidence in a news item; finding claims without evidence
3. Read laterally	What do other sources say about this website and this claim?	Comparing how two or three sources report the same event; searching for information about an unknown website
4. Separate facts from opinions	Can this be checked? Which words show opinion or emotion?	Sorting statements into facts and opinions; finding emotional and evaluative vocabulary
5. Recognise persuasive techniques	How is the text trying to influence me? What is missing?	Analysing advertisements and posts for techniques such as exaggeration, bandwagon and emotional appeal

The framework is intended not as a mechanical checklist, but as a set of habits of mind. S.A. Blakeslee's well-known CRAAP test (currency, relevance, authority, accuracy, purpose) [16] has been widely used in schools and libraries; however, as S. Wineburg and S. McGrew [14] note, checklists that focus only on the features of a website can be misleading, since unreliable websites may look professional. Therefore, the framework emphasises lateral reading and comparison of sources as the most important steps.

Classroom implementation. The framework can be integrated into English lessons in several ways. First, it can be used in reading lessons: before or after reading a text from the textbook or an authentic source, learners answer questions about its source, purpose and evidence. Second, special media literacy lessons can be organised around topics that are interesting for teenagers, such as health myths, viral videos, advertising for young people or news about technology. For example, learners may compare a sensational headline with the content of the article and with reports of the same event in other sources, then discuss why the headline was written in that way. Third, learners can create their own media texts – short news reports, posters or social media posts – and then analyse each other's texts using the framework. As R. Hobbs [8] emphasises, creating media messages is an important part of developing critical understanding.

The integration of media literacy into English lessons also contributes to language development. Learners acquire vocabulary related to the media (source, headline, evidence, bias, reliable, fake, claim), learn language for expressing doubt and evaluation (I'm not sure this is true because…, The author doesn't give any evidence…, This seems to be an opinion, not a fact…) and practise reading strategies such as skimming, scanning and close reading. P. Dummett and J. Hughes [17] emphasise that critical thinking in English language teaching is most effective when it is integrated into regular work with texts and language rather than taught separately. E.I. Passov [18] also underlines the unity of speech and thinking in communicative teaching.

Several conditions are important for effective implementation. Texts should be selected according to learners' language level (A2–B1) and interests, and difficult authentic texts may be shortened or accompanied by glossaries. Learners need language support in the form of sentence frames and key vocabulary. Discussions should be organised in pairs and small groups before whole-class discussion so that all learners participate. Finally, the teacher should avoid presenting media literacy only as protection against "dangerous" information; instead, the aim is to develop learners' curiosity, healthy scepticism and responsibility as consumers and creators of information. As J.J. Jalolov [19] notes, the effectiveness of foreign language teaching increases when learning material is connected with learners' interests and real-life communication.

Conclusion. In the modern information environment, the ability to evaluate online information is an essential component of critical thinking. Research on civic online reasoning shows that young people do not automatically develop this ability and need explicit instruction. The English lesson provides a natural context for such instruction, since learners work with English-language texts similar to those they encounter online.

The proposed five-step framework – identifying the source, checking the evidence, reading laterally, separating facts from opinions and recognising persuasive techniques – adapted to the age and language level of 8th grade learners, allows teachers to integrate media literacy into English lessons and to develop learners' critical thinking alongside their language skills. In this way, English lessons can help teenagers become more thoughtful, sceptical and responsible participants in the information society.

Further research will focus on developing a set of media literacy tasks based on authentic English-language materials for 8th grade learners and on designing tools for assessing their ability to evaluate online information.

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DEVELOPMENT OF EMPATHY IN CHILDHOOD

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Abstract. *This scholarly work is devoted to analyzing the psychological and pedagogical foundations of the formation and development of empathy during childhood. Empathy is defined as an individual's ability to understand and feel the emotional states of others and to respond appropriately, playing a crucial role in a child's social adaptation, moral development, and the effective establishment of interpersonal relationships. The study scientifically examines the stages of empathy development in childhood, its cognitive and affective components, as well as the key factors influencing its formation. The abstract emphasizes that the primary sources of empathy development include the emotional environment within the family, parental attitudes, and the love and attention provided to the child. Particularly during early childhood and the preschool years, interactions with adults, mechanisms of imitation, and the enrichment of emotional experiences play a decisive role in fostering empathy. Furthermore, peer interactions contribute to the development of social skills such as compassion, perspective-taking, and peaceful conflict resolution, which in turn enhance levels of empathy. The study also analyzes the pedagogical potential of educational institutions, particularly preschools and primary schools, in promoting empathy. Methods for developing empathic abilities through play activities, literature, role-playing, group exercises, and problem-solving situations are highlighted. The findings confirm that the development of empathy directly influences a child's emotional intelligence, moral values, and personal maturation. This work holds practical significance for educators, psychologists, and parents, offering scientific recommendations for effectively organizing empathic education.*

Keywords: *empathy, childhood, emotional development, socialization, upbringing, family, preschool age, communication, emotion, understanding, compassion, psychological development, personal maturation, peers, social environment, affective processes, cognitive development, moral education, emotional intelligence, interpersonal relationships.*

Introduction

The development of empathy during childhood is intrinsically linked to the early formative processes of the human psyche, emerging gradually as a result of the onset of affective sensitivity, the accumulation of social experience, the increasing complexity of communication forms, and the maturation of neuropsychological systems. The initial roots of empathy can be observed from the very first months of infancy, as a newborn's synchronous emotional response to another infant's crying is interpreted neurologically as the first manifestation of affective resonance characteristic of the mirror neuron system, thereby confirming the biological basis of empathy. Between six and twelve months of life, the child develops a mechanism known as "social referencing" by observing adults' emotional reactions; that is, the child determines how to respond to a novel situation not through their internal experience but by interpreting adults' facial expressions, tone of voice, and emotional responses. This phenomenon represents the initial formation of the mental model system, which constitutes the cognitive foundation of empathy.

By approximately 1.5 to 2 years of age, the child begins to exhibit simple prosocial behaviors, such as distinguishing others' emotional states, comparing them with their own experiences, and attempting to provide comfort, which indicates the strengthening interrelation between the affective and cognitive components of empathy. From the age of three, as the child forms the concept of a "self" distinct from others, empathy becomes increasingly differentiated; with the development of self-awareness, the child can separate others' emotions from their own, analyze them, and begin to interpret them in accordance with the social context. The preschool years (ages three to six) represent the most active period of empathy development, during which role-playing, imaginative activity, social interaction with peers, and adults' emotional exemplars constitute the primary learning environment.

Methodology

In particular, role-playing scenarios (e.g., doctor–patient, family, friends, teacher) allow the child to assume another person's perspective, strongly influencing the development of the cognitive component of empathy — the capacity for perspective-taking. According to Piaget and Vygotsky, it is during this stage that children begin to develop the capacity for mentalization — the ability to imagine and understand another person's thoughts, desires, motivations, and emotional states — a process that defines the essential nature of empathy. Between six and ten years of age, as the child's moral consciousness, understanding of social norms, experience in cooperation, and comprehension of social roles expand, empathy becomes increasingly complex; the child now responds to others' emotions not only affectively but also evaluates them within the context of social situations. As the child internalizes concepts such as justice, assistance, equality, and solidarity, more complex forms of prosocial behavior emerge.

The neuropsychological basis of this process includes significant development of the prefrontal cortex, strengthening of the emotional regulation system, and stabilization of neural connections between the limbic structures and cognitive systems of the brain. Empirical research indicates that the culture of family communication, parental emotional sensitivity, parenting practices oriented toward understanding the child's feelings, a psychologically safe and non-violent environment, and a socially affectionate atmosphere are among the most critical factors determining the subsequent level of empathy development. Conversely, neglect, emotional coldness, conflict-ridden environments, harshness, and unstable parenting practices slow the development of empathy and may even increase aggressive behavior, as children adopt reactive behavioral strategies based on self-protection rather than understanding others' emotions.

During adolescence (ages ten to sixteen), the cognitive component of empathy intensifies sharply due to the development of abstract reasoning, self-reflection, moral decision-making, and social identification processes, whereby the child begins to perceive themselves as a subject of a particular social role. Needs for peer group status, social acceptance, friendship, psychological closeness, and mutual reliance contribute to the deepening of empathy. Simultaneously, hormonal changes amplify emotions, increasing affective empathy, although the incomplete formation of emotional regulation may make managing empathy more challenging. In this period, pedagogical approaches, open communication with parents, and healthy psychological interaction with peers play a crucial role in the stable formation of empathy.

Psychological research indicates that the primary mechanisms for developing empathy in childhood include emotional communication, joint play, role-playing, analysis of problem situations, discussions about others' feelings, reflective analysis through stories, consistency in parental modeling, and the empathetic approach of educators. Modern educational systems widely

implement social-emotional learning (SEL) programs designed to cultivate empathy, whose effectiveness has been demonstrated by significant improvements in children's social competencies, self-regulation, conflict resolution, mutual respect, and psychological adaptability. The development of empathy in childhood lays a fundamental foundation for an individual's future psychological behavior, social relationships, moral decision-making capacity, professional adaptability, and even mental health. Individuals with well-developed empathy tend to be socially adaptable, communicatively skilled, low in aggression, resilient to stress, cooperative, and socially responsible.

During childhood, the formation of empathy is shaped through the dynamic interaction of genetic, biological, psychological, and social factors. In early childhood, neurobiological mechanisms that underpin emotional sensitivity—such as the mirror neuron system, limbic structures, and the initial integration of the prefrontal cortex—begin to function as the foundational basis of empathy. At this stage, the child's earliest experiences, the mother's affectionate interactions, consistent physical contact, hugging, and gentle vocal communication serve as sensorimotor-emotional stimuli that enhance emotional resonance in the brain, rendering the child more sensitive to the emotional states of others. Between the ages of two and three, despite the predominance of egocentric thinking, the child already begins to evoke internal emotional responses by observing another's joy or distress, reflecting the initial affective form of empathy. As social communication becomes more complex, the child's empathy elevates to the cognitive level, wherein the child not only experiences another's emotions but also attempts to understand their underlying causes.

This process is reinforced by higher cognitive functions of the psyche, including imagination, analysis, social evaluation of situations, and goal-directed reasoning. During the preschool period, the development of empathy is further accelerated through enhanced peer interaction, resolution of conflicts in collaborative play, role allocation, turn-taking, and cooperative task completion. In these activities, the child directly witnesses others' emotions and strives to comprehend their reactions, thereby constructing the cognitive model of empathy. The family environment plays a particularly crucial role at this stage: parental recognition and labeling of the child's emotions (e.g., "You are upset right now," "This is difficult for you," "I understand you") and emotionally supportive interactions facilitate the stable development of empathy. Conversely, environments in which the child's emotions are denied, ridiculed, or punished impede empathy, leading the child to lose interest in understanding both their own and others' emotional states.

Between six and ten years of age, the process of schoolification—whereby the child begins to understand their social role, internalize social norms and rules, develop communication culture, and establish emotional rapport with teachers—plays a critical role in empathy development. The school environment exposes the child to a variety of emotional situations daily: a friend's disappointment, a teacher's reprimand, a peer in need of help, conflicts, and disagreements. These experiences serve as a natural "training ground" for empathy. The teacher's pedagogical empathy further enhances the child's ability to understand others' emotions, as the teacher's gentle and emotionally sensitive conduct becomes a positive model in the child's consciousness. Empirical studies confirm that teachers with high empathy improve the classroom social climate, reduce stress levels, strengthen mutual respect, and directly foster increases in prosocial behavior and empathy among students. Thus, the pedagogical environment constitutes one of the principal external factors in shaping childhood empathy.

Between the ages of ten and fourteen, cognitive empathy becomes increasingly refined. The child can distinguish others' perspectives from their own, comprehend complex social motivations, consciously internalize moral norms, and interpret and understand complex social situations. This advancement facilitates the development of higher-order empathy, particularly the capacity for perspective-taking. Simultaneously, adolescence is marked by pronounced emotional fluctuations, hormonal instability, and identity exploration, which may temporarily diminish empathy or result in uneven development, as the adolescent's attention is increasingly directed toward self-concept, self-esteem, and social status. Nevertheless, supportive social environments, healthy peer relationships, open family communication, and parenting practices that reinforce psychological stability contribute to the sustained development of empathy.

Results

Contemporary neuropsychological research indicates that in childhood, brain structures responsible for affective empathy—such as the insula, amygdala, and cingulate cortex—are highly active. During adolescence, as integration with the prefrontal cortex strengthens, empathy encompasses not only emotional experience but also regulation, understanding, and deliberate engagement with another's emotional world. This neural maturation forms the neurobiological foundation for an individual's future social stability. Furthermore, fostering emotional literacy during upbringing—teaching the child to accurately label their emotions, respond appropriately, differentiate others' emotional states, and evaluate social situations—is crucial for the stable development of empathy and determines the child's psychological well-being in later stages.

Individuals whose childhood empathy is well-developed exhibit higher capacities in adulthood for avoiding social conflicts, demonstrating sensitivity in communication, providing assistance to others, managing stress, and forming healthy friendships and family relationships. Conversely, underdeveloped empathy may result in negative outcomes such as aggression, indifference, sociopathic tendencies, difficulties in social adaptation, a propensity for conflict, and emotional coldness. The development of empathy in childhood relies on the most delicate and sensitive periods of ontogenesis, as young children initially perceive their environment primarily through their own sensory experiences, subsequently comparing these experiences with the behaviors, vocal intonations, facial expressions, and body postures of others.

This process occurs through mechanisms such as "affective resonance," "emotional synchronization," and "emotional contagion." In early childhood, the quality of the mother–child attachment plays a crucial role in empathy formation. Children with secure attachment demonstrate high levels of emotional stability and a strong internal foundation for decision-making and behavior, enabling them to comprehend others' experiences more deeply and respond with appropriate reactions. In contrast, anxious or insecure attachment patterns negatively impact empathy development, potentially leading to maladaptive social behaviors such as misinterpretation of social cues, inability to regulate affective impulses, or excessive self-protection. The initial manifestations of empathy are observed around the age of two. At this stage, when a child witnesses another individual crying, they themselves tend to cry — a phenomenon known as "primordial empathy," which is not yet associated with conscious mentalization but rather results from emotional contagion.

By age three, the cognitive component of empathy begins to emerge, specifically the capacity for perspective-taking, enabling the child to recognize individual differences and distinguish their own emotions from those of others. During this period, neuropsychological development—particularly the maturation of the prefrontal cortex, activation of the mirror neuron

system, and the limbic system's capacity to integrate affective reactions—plays a decisive role in shaping more complex forms of empathy. Moreover, in childhood, the development of empathy is directly influenced by the pace of communication, the culture of family interaction, adults' emotional exemplars, parenting styles, social play, peer interactions, and cultural values. Role-playing games (e.g., "doctor–patient," "mother–child," "teacher–student") foster the child's ability to imagine another person's role and state, understand their needs, and anticipate their behavior, thereby cultivating essential empathic competencies. Research indicates that children who engage in frequent communication, receive emotional support, and experience explanation-based parenting develop empathy more rapidly and consistently.

Conversely, in families dominated by punishment, aggression, or neglect, the development of empathy slows, and in some cases, may scarcely develop. During the preschool period, the speech, facial expressions, pedagogical attitudes of educators, and the presence of positive social models in the environment facilitate empathy formation through "observational learning." According to Bandura's social-cognitive theory, the child first observes behavior, then internalizes and models it, subsequently reproducing it in real-life situations. Language development also plays a critical role in empathy formation, as children learn to articulate their own emotional states, label others' experiences, and explain distinctions between complex emotions. This process simultaneously cultivates an "inner dialogue"—a metacognitive mechanism that underlies the cognitive aspect of empathy. Consequently, children with a rich affective-intellectual vocabulary tend to exhibit more mature and nuanced empathic responses.

The role of teachers and the school environment in childhood empathy development is equally significant. A classroom culture characterized by mutual respect, cooperative assignments, group games, conflict resolution programs, communication ethics, and psychological safety fosters the consolidation of empathy as a social-practical skill. Particularly effective are specialized training activities designed to teach children to imagine others' experiences, such as analyzing the emotions of story characters, predicting feelings based on images, engaging in role-playing dialogues, and participating in group psychotechnical exercises, which simultaneously advance both the cognitive and affective components of empathy.

In the development of childhood empathy, an individual's temperamental characteristics, biological inheritance, nervous system type, and level of sensory sensitivity also exert significant influence. For instance, children with highly sensitive nervous systems perceive the emotional states of others more quickly, although they are at greater risk of emotional fatigue under excessive stimulation. Extroverted children, engaging more actively in social interaction, tend to strengthen empathy through practical social experiences, whereas introverted children enrich the cognitive aspects of empathy through internal observation and reflective analysis. Thus, empathy development in childhood is a multifactorial, complex, and gradual psychological process, with each of its components shaping the individual's future social adaptability, communicative competence, conflict management, cooperative abilities, and overall capacity for social integration.

During childhood, the process of empathy formation is closely intertwined with the accumulation of social experience, the increasing complexity of sensorimotor-cognitive activity, and the child's growing self-awareness. Throughout this process, the child gradually learns to regulate and express their own emotions, observe the emotional states of others, and interpret these states meaningfully. This acquisition process is fully integrated with the neuropsychological foundations of empathy: executive functions of the prefrontal cortex — including memory,

attention allocation, information processing, inhibition, and perspective-taking — consolidate the cognitive forms of empathy; the limbic system regulates affective resonance; and the mirror neuron system enhances the child's social sensitivity through automatic neural alignment with the movements, gestures, and facial expressions of others.

Simultaneously, empathy development is directly influenced by the educational and social environment. In daily life, the child models their internal standards of behavior on the emotional exemplars of adults: when parents accurately express their own emotions, listen to others, adapt to changing circumstances, and resolve conflicts constructively, the child internalizes these empathic behaviors as models. Conversely, if adults rely on emotional aggression, indifference, coldness, or strict punitive measures, the child is unable to form empathy properly. Emotional imbalance arises, the sense of security diminishes, and the child lacks the opportunity to understand their own emotions — all of which negatively impacts social interaction.

Another critical factor in strengthening empathy during childhood is participation in social play, particularly activities based on cooperation, role enactment, dramatization, group tasks, puppet theater, storytelling therapy, and story-analysis exercises. Through these experiences, the child explores various social roles in real life, imagines the inner experiences of characters, mentally reconstructs their decision-making processes, and significantly enhances their mentalization skills. Moreover, such play encourages the child to repeatedly ask themselves, "What would I do if I were in their place?" Consequently, empathy begins to develop not only at an affective level but also at a cognitive-contextual level.

Cross-cultural differences also exert a significant influence on the development of empathy in childhood. In collectivist societies, children tend to grow up relying more on one another, and empathy is primarily cultivated through social responsibility, adaptation to group interests, and prioritizing the needs of others. In contrast, in individualist societies, empathy develops more through respect for personal boundaries, independent decision-making, and the free expression of one's own opinions. Consequently, the social norms of empathy vary according to a society's value system, yet its fundamental function — understanding others and responding positively to them — remains universally significant.

Another critical aspect of empathy development in childhood is language acquisition. When a child possesses a sufficient vocabulary to express their own emotional states, labeling the emotions of others becomes easier, leading to the emergence of "emotional literacy," a competence that constitutes a core cognitive component of empathy. This literacy enables the child to accurately differentiate among complex emotional states, such as regret, anxiety, disappointment, joy, discomfort, pride, excitement, and guilt.

Discussion

The role of schools and educators during childhood is equally crucial. A psychologically safe classroom environment, teachers' fair and consistent attitudes, constructive feedback, encouragement of peer listening, opportunities for small-group work, freedom to express personal opinions, and transparency in assessment all strengthen the child's social interaction skills and foster empathic competencies. In particular, pedagogical techniques such as "emotional reflection," "compassionate dialogues," and "peer-support sessions" enable children not only to perceive the emotions of others but also to analyze their own internal states. Thus, the development of empathy in childhood has a direct impact on the individual's future psychological stability, social maturity, communicative competence, and capacity to recognize their role within a group. Children with well-developed empathy typically communicate effectively with peers, engage in

constructive interactions, approach conflicts cautiously, value the perspectives of others, and are more likely to develop into socially responsible adults.

Conversely, children with underdeveloped empathy are more prone to conflicts, aggressive responses, indifference, emotional coldness, or social isolation, which can adversely affect their psychological well-being, academic motivation, and interpersonal relationships. The process of empathy formation in childhood is influenced, on the one hand, by microenvironmental factors determined by the child's personal experiences, emotional needs, social support sources, and educational influences, and on the other hand, by macroenvironmental factors such as schools, cultural and societal values, and the psychological stability of the family system. The role of the family, as a primary element of the microenvironment, is unparalleled in the development of empathy during childhood. The child first learns emotional communication through interactions with family members, observing and imitating their reactions, gradually constructing a stable personal model. In families characterized by emotional warmth, affection, mutual respect, and support, children experience a sense of security, which enhances their readiness for empathic processes.

Conversely, familial tension, conflicts, emotional coldness, excessive criticism, or indifference reinforce defensive mechanisms within the child's emotional system, leading them to withdraw automatically from the process of understanding others' experiences, significantly impeding the development of empathy. This process is particularly sensitive between the ages of two and seven, a period during which the child's sense of self becomes more consolidated, verbal expression of emotions expands, and initial understandings of social roles emerge, providing fertile ground for the natural evolution of empathy. Neuropsychological maturation also plays a central role in empathy development. As the child grows, neural connectivity in the brain strengthens, and prefrontal cortex activity becomes increasingly complex. In particular, the integrated functioning of the dorsolateral, orbitofrontal, and ventromedial regions facilitates the harmonization of affective and cognitive empathy systems.

The mirror neuron system — neurons that automatically "replicate" the internal meaning of observed actions, facial expressions, and vocal intonations of others — constitutes the biological foundation of childhood empathy. For instance, when a child observes another person experiencing joy, they may feel happiness themselves; when witnessing another's distress or tears, they may experience compassion. Over time, these processes become enriched by conscious mentalization. Language and speech development are closely linked to empathy formation in childhood. The more proficiently a child can label their own emotions, the easier it becomes for them to interpret the feelings of others. Children with limited language skills often exhibit empathic processes that are vague, situational, or misinterpreted, as they struggle to differentiate between complex emotional states. In contrast, children with advanced language abilities demonstrate empathy not only at an affective level but also at cognitive, analytical, and reflective stages.

Peer interaction is another critical factor in empathy development. During play, children naturally acquire skills such as anticipating others' perspectives, listening attentively, and coordinating their roles with those of their peers. Conflicts among peers serve as a natural learning environment for empathy: when disagreements arise, the child attempts to recognize and compare their own emotions with those of others and strives to reach a resolution, thereby strengthening internal emotional balance. If educators or teachers guide conflicts appropriately, children learn to resolve problems based on empathy; if conflicts are neglected, children may develop aggressive or

passive behavioral models. Finally, the cultural context constitutes another significant factor influencing the development of childhood empathy.

In every society, norms for expressing emotions, standards of interpersonal communication, expectations of care and compassion, family structures, and educational traditions vary. For instance, in some societies, open expression of children's emotions is encouraged, whereas in others, children are expected to remain quiet, exercise self-restraint, and prioritize social conformity. These differences directly influence the dynamics of empathy development: in cultures that emphasize open communication, children more quickly perceive the emotions of others, engage in free discussions about feelings, and thereby enrich the empathic system; in cultural contexts that restrict emotional expression, empathic processes develop more through internal observation, situational analysis, and interpretation of nonverbal cues.

Pedagogical techniques also play a highly effective role in empathy formation. Beginning in early childhood education, methods such as story analysis, role-playing games, dramatization, activities designed to develop emotional reasoning, "emotion cards," exercises like "identify the character's feelings," and reflective prompts such as "what would I do in their place" foster deep social-perceptual competencies in the child's worldview. Children with well-developed empathy are typically able to articulate their own thoughts clearly, appreciate the perspectives of others, contribute to a healthy group environment, and maintain high motivation in learning. Biological inheritance and temperament traits also play a significant role in the development of childhood empathy. For example, children with innate high sensitivity perceive the emotions of others very quickly, but may also be more susceptible to stress; curious and active children tend to develop empathy primarily through social experience, whereas quiet and introverted children acquire more reflective forms of empathy.

Childhood represents one of the most crucial periods in a person's emotional and social development. During this stage, children gradually develop the ability to recognize the feelings of others and respond appropriately. Psychological research indicates that in early childhood, empathy is primarily expressed through affective components. During the initial years (ages 1–3), children perceive the emotional states of others, such as interpreting parental laughter or crying, in a unique, intuitive manner. At this stage, empathy is largely instinctive and automatic. Between ages 3 and 7, children further develop the ability to identify emotional states and engage with others. During this period, the following pedagogical methods are particularly effective in fostering empathy:

- Explaining the feelings of others through stories and fairy tales;
- Demonstrating emotional situations through role-playing games;
- Encouraging children to express their own thoughts through communicative exercises.

The development of empathy in childhood directly affects a child's social skills and ability to interact successfully with others. Therefore, special attention must be paid in pedagogical practice to nurturing children's emotional sensitivity.

Conclusion

In summary, the development of empathy in childhood constitutes a crucial component of personality formation. Empathy plays a leading role in a child's ability to establish healthy relationships with others, adapt to social environments, and internalize moral values. The empathic abilities formed during this period directly influence the child's behavior, communication skills, and emotional stability in subsequent stages of development. Research indicates that the

development of empathy is not a random process; rather, it should be actively supported through purposeful upbringing, a favorable emotional environment, and effective pedagogical approaches.

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INTERRELATIONSHIP BETWEEN GENDER-BASED PSYCHOLOGICAL CHARACTERISTICS OF MARITAL MOTIVES AND INDICATORS OF FAMILY STABILITY

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Abstract. *This article analyzes the gender-related psychological characteristics of marriage motives and their relationship with indicators of family stability. During the research, the motives of men and women for entering marriage, their psychological differences, and the influence of these motives on family stability were studied. The research results show that the harmony of marriage motives and socio-psychological compatibility are among the important factors that ensure the stability and strength of the family.*

Keywords: *marriage motives, gender, family relations, family stability, psychological compatibility, family values.*

Introduction

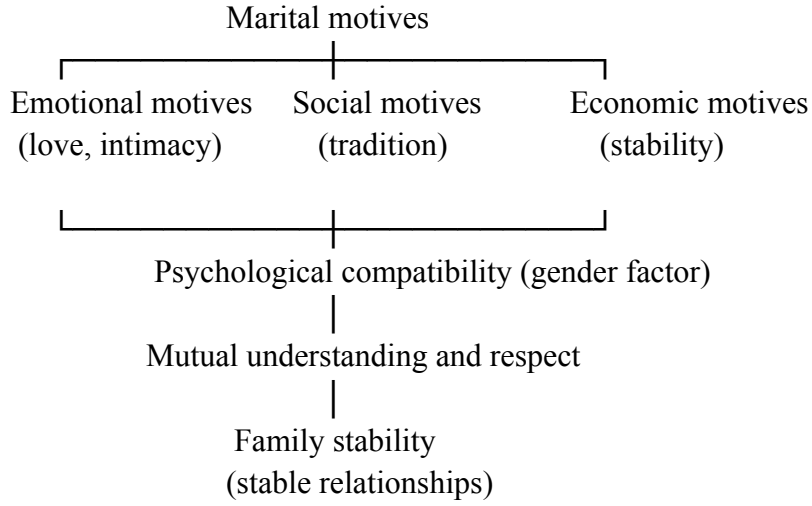
The family is considered one of the most important social institutions in society. The development of society, continuity of generations, and personal growth are directly dependent on the family environment. Therefore, the issue of family stability is regarded as one of the key research areas in the fields of psychology, pedagogy, and sociology.

Marriage is not only a union of two individuals but also a harmonization of their social, psychological, and cultural values. Each individual enters marriage based on different motives. These motives are often related to a person's psychological sex, that is, gender characteristics. Political, economic, and spiritual-educational changes occurring in society also affect the family. The development of information technologies, spouses living separately (for example, due to one of them working abroad), the lack of educational, legal, and moral knowledge among young people entering marriage and young families, their limited worldview, and the emerging sense of "alienation" among family members all serve to highlight the relevance of this topic.

Socio-political, economic, and spiritual-educational changes occurring in society inevitably affect the family as well. The rapid development of information technologies, spouses living separately (for example, due to one of them working abroad), the lack of educational, legal, and moral knowledge among young people entering marriage and young families, their limited worldview, and the emerging sense of "alienation" among family members all confirm the relevance of this topic.

According to N.N. Obozov, who conducted numerous scientific studies, dissatisfaction with family life, marital instability, and divorce can be explained by the equalization of socio-economic functions between husband and wife. S.V. Kovalev emphasizes that due to the insufficient formation of correct ideas about family life and lifestyle among young people, dissatisfaction with marital and family relations is frequently observed after marriage. In modern society, the changing social roles of men and women also influence the formation of marital motives. Therefore, studying marital motives from a gender perspective has significant scientific

importance in ensuring family stability. The study of marital motives and family relationships is one of the widely researched issues in psychology. A number of scholars have analyzed marital motives in relation to personal needs, social factors, and cultural values..



In psychological research, marital motives are classified into the following main groups:

• emotional motives (love, affection, psychological closeness);

• social motives (the tradition of starting a family, societal expectations);

• economic motives (financial stability);

• personal development motives.

Studies in gender psychology show that men and women expect to satisfy different psychological needs through marriage. For example, women tend to value emotional support and family stability more, whereas men often prioritize motives related to social status and family roles. Gender stereotypes are transmitted from generation to generation, both consciously and unconsciously, through the process of family upbringing. These stereotypes are often reinforced by traditions, customs, and cultural views, and to some extent, they limit the full personal development of children.

At the same time, modern legal systems recognize gender equality as an important factor in societal development. This situation indicates the existence of certain contradictions between family psychology and legal norms. Therefore, studying the impact of gender stereotypes on child upbringing and the formation of social consciousness through a comprehensive approach—combining psychological and legal perspectives—remains a relevant scientific issue. This study empirically examined the gender characteristics of marital motives and their impact on family stability. The research utilized psychological questionnaires, interviews, and statistical analysis methods.

The respondents consisted of married men and women, who were selected as the object of the study. During the research, the following indicators were examined:

motives for entering marriage;

level of marital satisfaction;

mutual understanding;

methods of conflict resolution;

family stability.

The results of the study showed that there is a certain correlation between marital motives and family stability. It was found that, in women, marital motives are more closely associated with the following:

- emotional closeness;
- desire to start a family;
- child-rearing.

In men, the following motives were found to be more dominant:

- social status;
- family responsibility;
- financial provision.

The study indicated that the compatibility of marital motives ensures stability in family relationships. Conversely, differences between motives may lead to the emergence of family conflicts. Marital motives are one of the complex psychological factors that develop in the process of an individual's socialization. A person's attitude toward marriage, as well as their expectations and needs from it, is closely linked to their personal experiences, upbringing environment, and the social values of the society. From this perspective, marital motives manifest not only as a personal decision but also as a socio-psychological process.

In psychology, marital motives are explained by various factors. Some researchers associate the primary reasons for entering marriage with emotional needs, the desire for closeness, love, and mutual understanding, while others link them to social status, economic stability, and the traditional expectations of society. These factors may manifest differently depending on a person's psychological sex, that is, their gender characteristics. From the perspective of gender psychology, there are certain differences in men's and women's attitudes toward marriage. Women usually consider emotional closeness, affection, and psychological support as important in family relationships. For them, the family is not only a social institution but also a source of personal happiness and psychological stability. Men, on the other hand, often evaluate marriage in terms of social responsibility, family roles, and financial provision.

The relationship between marital motives and family stability is a key issue in psychological research. Family stability is based on mutual respect, trust, psychological compatibility, and a shared system of values between spouses. If partners enter marriage with similar motives, their mutual relationships tend to be more stable. Research shows that discrepancies in marital motives often lead to family conflicts. For example, if the primary motive for marriage is emotional closeness for one partner but social or economic benefits for the other, the likelihood of misunderstandings between spouses increases over time. Therefore, studying marital motives is one of the important directions in family psychology.

In modern society, social and cultural changes also influence the formation of marital motives. Processes such as urbanization, higher levels of education, increased social activity of women, and greater personal independence have led to changing perspectives on marriage. This, in turn, requires a deeper study of the gender characteristics of marital motives. Additionally, psychological preparedness plays a crucial role in ensuring family stability. Young people having sufficient knowledge about the psychological, social, and moral aspects of marriage before entering into it helps to ensure the stability of future family relationships. Therefore, promoting knowledge of family psychology and marital culture within the education system is of great importance.

Overall, the study of marital motives and their gender characteristics holds significant scientific and practical importance in ensuring family stability, preventing family conflicts, and fostering a healthy social environment. Gender-equitable upbringing allows children to explore roles and activities without being constrained by gender stereotypes. For example, girls can

participate in sports, and boys can engage in creative activities. This approach enhances their social activity and initiative. Children develop skills for cooperation, exchanging ideas, and solving problems together.

Equitable upbringing also boosts self-esteem: children gain the ability to value themselves and express their opinions. Stress and social pressure are reduced, as children are not criticized for interests or abilities that do not conform to traditional gender stereotypes. As a result, a child develops as a psychologically stable and self-confident individual. Through gender-equitable upbringing, children learn to respect their own rights and the rights of others, as well as to oppose gender-based discrimination, value justice, and apply principles of equality in practice. This, in turn, fosters their development into socially responsible citizens with a strong sense of civic awareness. Such a model is important not only for individual development but also for promoting equality and social stability in society.

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POLITICAL PARTY IDEOLOGIES: PHILOSOPHICAL FOUNDATIONS AND THEIR ROLE IN MODERN SOCIETY

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Abstract. *This article examines the philosophical essence and social significance of political party ideology in the context of modern society and globalization. Ideology is analyzed as a historically formed system of ideas and values that shapes political consciousness, social behavior, and collective identity. In addition, it emphasizes the importance of ideology in strengthening national identity, responding to ideological challenges, and meeting the spiritual needs of citizens, especially youth. Special attention is given to the guiding, unifying, and truth-revealing functions of ideology, as well as its role in legitimizing power and shaping civic engagement.*

Keywords: *political ideology; political parties, social philosophy, globalization, civic engagement, political consciousness, national identity, moral foundations.*

Introduction

In contemporary society, political party ideology serves as a decisive factor in shaping public consciousness, political structures, and social development. Ideology is not merely a collection of political slogans but a coherent system of values and principles that guides both individual and collective action. It reflects the historical experience, cultural worldview, and socio-economic conditions of a society, while simultaneously orienting it toward future development.

The First President of the Republic of Uzbekistan, Islam Karimov, defined ideology as a bridge connecting the historical past with the future aspirations of a nation. This understanding highlights ideology's dual character: it preserves historical memory while shaping strategic goals. Similarly, the current President of Uzbekistan, Shavkat Mirziyoyev, emphasized that political parties must fulfill the ideological needs of citizens, particularly young people, in order to prevent destructive influences from occupying the ideological space.

From a philosophical perspective, ideology functions as the practical embodiment of theoretical thought. While philosophy addresses fundamental questions about existence and meaning, ideology translates these reflections into concrete political programs and social objectives. In this regard, every political ideology rests upon a philosophical foundation and emerges within a specific historical and cultural context. In the era of globalization, where traditional political and economic boundaries are increasingly blurred, the reassessment of party ideology becomes particularly relevant. Understanding its essence, functions, and adaptive capacity is essential for analyzing modern political processes and ensuring social stability.

The main part. In modern society, the ideology of political parties plays a decisive role in shaping public consciousness and political structures. The First President of the Republic of Uzbekistan, Islam Karimov, defined ideology as follows: "I consider the ideology of society to be an idea based on the worldview and mentality of people formed over millennia, while simultaneously aiming for the future of this people, this nation, and serving to clearly define its place in the world, capable of acting as a unique bridge between yesterday and tomorrow."

Historically, ideologies have served as the foundation for organizing social movements, imbuing them with specific goals and values. Within the framework of social philosophy, this aspect is particularly relevant, as ideology shapes not only political beliefs but also social practices, stimulating the emergence of political distinctiveness. In the context of globalization, the traditional boundaries between economic and political actors are disappearing, indicating the need to reassess the role of political parties in society. Regarding this, the President of the Republic of Uzbekistan Shavkat Mirziyoyev stated: "Parties must satisfy the ideological needs of our citizens, especially our youth. If parties fail to achieve this, there is no doubt that malicious forces will attempt to fill this void. In some cases, they are already doing so - there's no need to conceal this fact." Indeed, the ideology of a political party should comprise a system of views and beliefs that form the basis of its political practice and guide the activities of its members.

Defining this ideology involves not only formulating political goals but also developing a deeper understanding of the socio-cultural, historical, and economic contexts in which the party operates. An important aspect of ideological analysis is its ability to adapt to societal changes. This, as N.Ravochkin emphasized, requires a comparative study of political and legal institutions. Thus, party ideology is not merely a tool for political maneuvering but also a crucial mechanism for shaping the personal and collective identity of its members. The expansion of research in this field allows for the identification of specific features of party ideology, its influence on social movements, and the process of legitimizing power. Ideology is a set of ideas that mobilizes the consciousness of individuals and society in a particular direction. It acts as a spiritual force that either advances or hinders societal development. From a philosophical perspective, ideology is a system of general views that shape a person's position towards the world, life, other people, and themselves. It manifests as an expression of human consciousness, a means of understanding and transforming social reality.

While philosophy contemplates the world in a general, profound, and theoretical manner, ideology serves as its practical expression, forming a worldview directed towards a specific goal. If philosophy seeks to answer the question "What is life?," ideology proposes an answer to "What should life be like?" In this regard, every ideology has a philosophical foundation; it is neither random nor merely a collection of political slogans. For instance, liberal ideology places human freedom, private property, and personal initiative at its core. These ideas are nourished by the philosophies of John Locke, Immanuel Kant, Tocqueville, and other thinkers. Similarly, social ideology, based on the concepts of social equality, justice, and universal well-being, draws inspiration from the philosophical concepts of Marx, Rousseau, and others.

Ideology is a purposeful expression of human consciousness, formed and deliberated within a specific historical and cultural context. It defines who a person is, how they should live, and what they should strive for. In other words, ideology shapes a person's spiritual and moral direction. In any society, individuals act under the influence of various ideas. One person may consider independence as the highest value, while another prioritizes justice. The totality of these ideas constitutes ideology. It is not merely thoughts, but a system of values that becomes a way of life. Ideology is never "neutral." It emerges from a specific historical situation. For example, for a people who have gained independence from colonialism, ideology means restoring national identity, preserving culture, and reinforcing the idea of independence. Conversely, in stable democratic societies, ideology is formed more around freedom, human rights, and civic engagement. Therefore, to understand ideology, it is necessary to consider the history, worldview,

and political and cultural situation of a society. It is always an expression of its time, simultaneously influencing and being influenced.

The philosophical essence of ideology is manifested in its guiding, unifying, and truth-revealing functions:

Guiding function: ideology gives meaning to human and societal activities, directing them towards a specific goal. It creates a foundation for understanding why these activities are being carried out, what they serve, and what results they should achieve.

Unifying function: it unites different individuals and groups around a common idea. It mitigates internal conflicts in society and shapes common interests.

Truth-revealing function: ideology represents reality from a certain perspective. It provides a person with a "viewing angle" - showing how to look at the world.

Ideology always relies on a moral foundation. Its stability and impact are directly related to its spiritual purity. If ideology becomes merely a collection of interests, it loses its value in people's minds. Therefore, in the philosophical analysis of any ideology, "moral principles" deserve special attention.

The philosophical essence of ideology is understanding its role as a guiding, spiritual, moral, and social force in human life. It serves as an ideological mirror that defines who a person is, what their life should be like, and what goals society should pursue. Through philosophical analysis, the inner content of ideology and its influence on the human psyche and social life are understood more deeply. Therefore, we must remember that any ideology is not just a set of slogans, but a spiritual process based on philosophical ideas.

The ideology of political parties forms the foundation of their activities and position in society. Parties without a clearly defined ideology lose their essence and cannot effectively respond to the demands of the times, which leads to contradictions and instability in society. The importance of ideology is manifested in its ability to unite supporters around common values and goals, enabling the formation of stable social connections and enhancing the legitimacy of leaders. Furthermore, insufficient attention to ideological foundations can cause serious misunderstandings and conflicts between various social groups, including parties and public movements.

The evolution of political ideologies throughout history is a complex process involving the interplay of various socio-cultural factors and historical conditions. Political ideologies do not form in a vacuum; rather, they emerge in response to the demands of the times, including social, economic, and environmental changes. For instance, in the context of modern global challenges such as climate change and social inequality, it is crucial to understand how different ideologies respond and adapt to these issues. This underscores the necessity of applying the practical approach proposed by the philosophical tradition of American pragmatism specifically in this socio-economic context. These philosophical approaches, deeply permeating political consciousness, serve to create the multifaceted ideological foundations essential for adapting party ideologies to contemporary problems.

Political ideology is formed on the basis of several theories, among which liberalism and conservatism occupy a central place. Liberalism focuses on individual rights and freedoms, striving to create conditions for social progress and economic exchange, which leads to the support of democratic institutions and a market economy. In contrast, conservatism emphasizes the importance of traditions, stability, and social hierarchy, advocating caution against drastic changes that could threaten the cultural and moral foundations of society. These theories not only stand in opposition to each other but also interact in modern political debates, reflecting the complex reality

of the globalized world. The ideology of political parties plays a crucial role in shaping the political behavior of individuals and groups.

It serves as a foundation for understanding and interpreting political events, instilling specific beliefs and feelings in supporters that influence their activity in social life. For instance, a study analyzing tweets by Spanish political parties demonstrates that the expression of emotions in communication is linked to ideological differences between parties. Furthermore, a systematic approach to party history and education reveals how integrating ideology and educational resources can enhance the effectiveness of ideological work among students. Thus, the interaction between ideology and political behavior remains one of the central aspects in the study of modern political processes.

Ideology plays a decisive role in shaping policy, defining the goals and methods of political activity. The assessment judgments that express citizens' personal attitudes towards political and power-related phenomena are significant spiritual factors in increasing civic engagement. The existence of such personal, meaningful relationships indicates a person's ability to act as a political subject who understands their civic duty. In the context of constant competition between different ideologies, the need arises to analyze their impact on mega-political processes. For example, the relationship between the liberal opposition and conservative traditional movements in Russia demonstrates a complex dynamic. In this case, each side forms its own views on power and civic responsibility. This clash of ideas not only addresses pressing issues but also determines the country's political future. Thus, the influence of ideology on policy formation becomes an important factor that shapes not only practical actions but also the main directions of social development.

The ideology of political parties significantly influences social outcomes in society by shaping the collective values and behavior of citizens. Political parties representing the interests of various groups create platforms that reflect their ideology, which in turn guides public opinion and social movements. For instance, in the context of globalization, where diverse cultural and economic processes become interconnected, this influence may intensify. Notably, Chinese philosophy offers a unique approach to globalization, emphasizing the importance of harmonious coexistence among cultures, which allows for consideration of specific social conditions and values. On the other hand, the example of conservative republicanism demonstrates that the ineffectiveness of an implemented ideology can lead to social crises, indicating the need to reassess ideas to achieve social unity. Generally speaking, no ideology is universal; their success varies in different contexts, and this process develops in a spiral pattern.

Conclusion

The analysis demonstrates that political party ideology represents a complex and dynamic phenomenon that integrates philosophical foundations, moral principles, and practical political objectives. It shapes political consciousness, mobilizes citizens, and provides legitimacy to political authority. Ideology performs guiding, unifying, and interpretative functions, directing social development and forming collective identity.

The evolution of political ideologies reflects changing historical conditions and socio-cultural realities. Liberalism and conservatism, as dominant ideological frameworks, continue to influence contemporary political discourse, while globalization introduces new challenges requiring ideological adaptation. In this context, political parties must continuously refine their ideological platforms to remain responsive to societal needs.

Ultimately, ideology is not a neutral or static construct; it is a purposeful and historically conditioned system of ideas that influences both individual worldviews and societal trajectories. A deep philosophical understanding of political party ideology allows for a more comprehensive assessment of its role in policy formation, civic engagement, and the overall stability and progress of modern society.

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THE ESSENCE OF THE TRANSFORMATION OF POLITICAL PARTY IDEOLOGIES

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Abstract. *This article analyzes the ideology of political parties and the processes of its transformation. The party ideology is interpreted as a system of beliefs and values that determines the activity, policy, and objectives of political structures. The author explores the complex mechanisms of ideological change influenced by cultural, social, and technological factors. In addition, the study highlights the significance of ideological adaptability, leadership change, and party branding in modern political processes.*

Keywords: *political party, ideology, political process, ideological adaptability, leadership, party brand, political thought, transformation.*

Introduction

The ideology of a political party encompasses a system of beliefs and values that guide the party's activities, policies, and goals. This ideology is the foundation of the party's identity and mission, and it determines the way political organizations respond to societal issues. Understanding the evolution of these ideologies requires considering the cultural context in which they exist. Understanding ideological evolution is crucial for understanding the dynamics of political parties and the broader democratic landscape. Ideologies shape party programs and influence policy decisions, often reflecting societal changes and cultural shifts. The transformation of such ideologies can reveal key mechanisms of political adaptation.

For example, in 2025, the factions of the "Movement of Entrepreneurs and Businessmen - Liberal Democratic Party of Uzbekistan" and the "Milliy Tiklanish" democratic party in the Legislative Chamber of the Oliy Majlis jointly formed the "Development Bloc". At the same time, the People's Democratic Party announced that it was the opposition to this bloc. The political platform and ideology that had been formed over the years underwent transformation from the point of view of both the bloc and the opposition and was influenced by a number of factors.

Changes in the ideologies of political parties occur under the influence of very complex mechanisms. The interaction of societal values, economic crises, and branding methods is crucial. In the process of adapting to changes in public opinion, political parties are often forced to reformulate their ideological views in accordance with the problems of modern governance.

Literature review

As the landscape of political party ideologies continues to change, the underlying mechanisms that drive these changes require in-depth analysis. At the heart of this discussion is the central idea that the development of ideologies is closely linked to the interaction of technological advances and socio-political conditions.

In particular, the emergence of digital media has transformed the way political parties interact with voters, creating new relationships characterized by increased interaction and targeted messaging. In addition, the combination of historical and cultural factors, particularly in the case of modern China, highlights the important role of family relationships and traditional values in the

formation of political ideas. The main idea here is that political ideologies are not fixed concepts, but dynamic phenomena shaped by both external technological forces and deep social structures.

Results

The historical context of political party ideologies is crucial for understanding their development and change over time. Political ideologies are not static; they adapt to the socio-economic, cultural, and historical conditions around them. For example, in interwar Yugoslavia, the ruling political elites attempted to manage complex national identities through a Yugoslavism that aligned with different national ideas. However, over time, the ruling elites' inability to unite around a single Yugoslav national identity led to increased conflict between ethnic groups and ultimately undermined the credibility of the Yugoslav idea.

This process of discrediting demonstrated how political ideologies could become entrenched and closely associated with particular regimes. This was evident in the centralization and authoritarianism that characterized Yugoslav rule towards the end of the period.The fact that ideologies disappear without transformation can be seen not only in Yugoslavia, but also in the case of the collapse of the ideology that included entire socio-political doctrines that were tried to develop in the former Soviet Union. After all, the ideology of the Soviet Union was not related to socialism or communism, but also included aspects that covered other issues, such as the Soviet citizen, which required socio-cultural integration. This is a clear example of the transformation of the ideology of political parties under both external and internal influence.

Over time, political ideologies undergo significant changes under the influence of historical circumstances and socio-economic processes. The development of political thought is not a linear process, but reflects a complex interaction between various structures and phenomena that shape the views and behavior of society. However, studying the multifaceted nature of political ideologies reveals a nuanced analysis that emphasizes the importance of context in shaping the development of political parties over time.

The study of ideological changes in political parties often reveals important information about the mechanisms that drive changes in these structures. For example, the crisis of Islamic political parties in Indonesia shows that the failure to translate ideological principles into practical programs leads to a decline in legitimacy and electoral power. The issue of Islamic political parties is extremely complex, and although religious parties are banned in most democratic countries, these institutions have survived in countries where the influence of religious scholars is uncontrollably high. In such circumstances, politics is faced with the difficult task of reconciling religious beliefs with democratic values. The process of transforming the Tahrir al-Sham (HTS) organization, which has been operating and continues to operate in Syria, from a terrorist organization into an administrative and even relatively democratic institution, is a clear example of this. This process can be analyzed not only as a military or political one, but also as a comprehensive socio-philosophical process.

The influence of social movements on the ideology of political parties is an important factor in changing the political landscape. Historically, social movements have been a driving force for ideological change, expressing the concerns and aspirations of people from marginalized groups and advocating for political reforms that meet their demands. For example, movements for civil rights or economic justice often force political parties to adapt their platforms to the changing values of voters. Theoretical frameworks such as the theory of economic elite dominance suggest that organized groups, especially those representing business interests, dominate public policy debates and thereby influence the ideologies of political parties. However, successful social

movements can counterbalance this dominance and ensure that the broader views of society are included in the political dialogue. As a result, understanding the interaction between social movements and party ideologies reveals how grassroots efforts can change political opinions to promote more inclusive governance. Ultimately, understanding the interaction between social movements and party ideologies reveals how grassroots efforts can change political narratives to promote more inclusive governance.

Globalization has had a significant impact on the transformation of political ideologies around the world, often leading to the rise of populist movements. The close integration of economies and cultures has exposed marginalized groups to rapid social change, which has led to resentment and a desire for representation. This fragmentation of social groups, especially among those who feel disenfranchised by neoliberal policies, has created the conditions for the emergence of populist sentiments directed against traditional elites and other culprits, such as immigrants or minorities. While such movements may initially contribute to democratization, once they gain power, they can weaken democratic institutions, undermining the checks and balances that are integral to governance. Moreover, in this way, globalization acts as both a catalyst for change and a challenge to established political norms.

The process of ideological change in political parties is significantly influenced by internal factors that shape the party's identity and its appeal to voters. A key aspect of this change is the coherence of ideological discourse, as parties must express coherent ideas that resonate with their members. The effectiveness of such ideas is often enhanced by the stability of a strong party organization and leadership, which in turn strengthens trust and stability among voters. Furthermore, the concept of political branding is important because parties need to create a distinctive and credible image. This process is achieved by aligning the party’s declared values with the perceptions of its members; any inconsistency can lead to the emergence of a false brand that damages the party’s reputation. This internal dynamic suggests that a political party’s capacity for ideological flexibility depends on its organizational integrity and the authenticity of its messages.

Conclusion

The phenomenon of leadership changes in political parties has a significant impact on the transformation of party ideology, serving as both a catalyst and a reflection of broader societal changes. As party leadership changes, this often means a reassessment of its core principles, influenced by external factors such as the economic situation and public opinion. Thus, leadership changes in political parties are important in understanding the dynamic nature of changing political ideologies. The process of revising party platforms is an important mechanism in the development of political party ideology, reflecting changes in societal values and priorities. Such revisions are often a response to internal and external influences, such as changes in voter demographics and public opinion.

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MORAL ISSUES IN THE WORKS OF CENTRAL ASIAN THINKERS (IX–XII CENTURIES)

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Abstract. *This article analyzes the moral views of Central Asian thinkers who lived and worked during the IX–XII centuries. The study focuses on prominent scholars such as Abu Nasr al-Farabi, Abu Ali Ibn Sina, Abu Raykhon Beruni, and Yusuf Khajib, examining their reflections on morality, ethics, and human perfection, as well as the social impact of their ideas. The article also pays special attention to the connection between Islamic ethics and philosophy, highlighting their intellectual legacy.*

Keywords: *moral values; ethical heritage; spiritual maturity; spiritual legacy; patriotism; personal perfection; Central Asian moral thought; social ethics; humanism; contemporary values*.

Introduction

It is well known that high moral values serve as the foundation of any society's development and reflect its level of spiritual maturity. Accordingly, in the context of building the "Democratic Legal State and Civil Society" in Uzbekistan—the "Uzbek model"—special attention is paid to the moral and intellectual development of young people. As emphasized by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev: *"If our youth possess high moral education, patriotism, and spiritual purity, no external threats can mislead us"* [1].

These considerations not only serve as guidance for raising today's generation but also highlight the importance of deeply studying our historical spiritual heritage, passed down from generation to generation. In particular, the intellectual environment of Central Asia in the IX–XII centuries—with its scholars, philosophers, and thinkers—represents a crucial period whose scientific and moral contributions retain enormous relevance today. During this era, the Muslim East, especially the region of Mawarannahr, witnessed a revival of science and spirituality that made a significant contribution to global civilization.

The thinkers of this period, including Abu Nasr al-Farabi, Ibn Sina, Abu Raykhon Beruni, and Yusuf Khajib, laid the foundations of scientific and moral development for subsequent generations. Their works addressed ethics not only from a religious perspective but also from social, philosophical, and humanistic viewpoints. This study aims to examine the ethical views of Central Asian thinkers of the IX–XII centuries, revealing their harmony with universal and contemporary values. Researching these works and integrating them into educational processes remains an urgent task.

Research Methods

The study employed methods including source analysis, objectivity, analysis and synthesis, comparison, creativity, historical approach, and logical reasoning.

Literature Review

Research on the ethical thought of Central Asia highlights the works of IX–XII century scholars as key sources. Their moral views are studied today in fields such as ethics, pedagogy,

philosophy, and religious studies. Al-Farabi, in his work *"Thoughts of the Virtuous Citizens"*, envisages building an ideal moral society. According to the scholar, the virtuous citizen must achieve spiritual perfection and be equipped with ethical virtues [2]. I. Sultonov evaluates Al-Farabi's ethical ideas as follows: *"Al-Farabi was able to integrate ethics with politics, advancing the idea of a perfect state through the moral development of society"* [3].

Ibn Sina analyzed moral virtues not only in a religious context but also in medical and philosophical dimensions. In his *Canon of Medicine*, he identifies the cultivation of the soul, willpower, honesty, patience, and reflection as fundamental to human spiritual well-being [4,5]. Abu Raykhon Beruni emphasized moral integrity and truthfulness in scientific activity. In his works *India* and *Monuments of Ancient Peoples*, he promoted scientific honesty and impartiality as key principles [6,7]. Academician B. Gafurov described Beruni as a thinker who could harmonize knowledge with ethics, considering truth the highest value [8].

The work *Qutadghu Bilig* is regarded as a major example of Central Asian moral thought, portraying ethical relations between rulers, advisors, officials, and the people in poetic-philosophical language. A. Shoniyozov notes that Yusuf Khajib's work represents the pinnacle of Turkic ethical-philosophical thought, remaining fully relevant to modern governance and social ethics [9,10]. The analysis of these thinkers demonstrates that IX–XII century ethics in Central Asia has immense importance for shaping contemporary moral consciousness. Their works provided practical guidance for implementing moral perfection in daily life, beyond mere religious instruction.

Research Results

As noted, high moral values serve as the foundation of any society's development and reflect its level of spiritual maturity. These values contribute not only to the personal perfection of individuals but also to the stability, unity, and progress of the entire society. Experience from developed states demonstrates that material development cannot be sustainable without a corresponding moral and spiritual foundation.

From this perspective, the above analysis shows that Central Asian thinkers of the IX–XII centuries made a significant contribution to the development of ethical thought. Their ideas remain highly relevant today, particularly in addressing contemporary moral challenges. The table below presents a concise analysis of the ethical views of several prominent thinkers from Central Asia during the IX–XII centuries, highlighting their main works and contemporary significance:

Scholar	Works	Main Ethical Ideas	Contemporary Relevance
Abu Nasr Farabi	The Views of the Inhabitants of the Virtuous City	The concept of a virtuous individual and a virtuous society; political morality; wise and just leadership	Building a perfect society, ethical leadership, social justice
Abu Ali Ibn Sina	The Book of Knowledge (Donishnoma), Kitob ush-shifo (The Book of Healing)	Self-discipline, honesty, willpower, and spiritual purity	Personal perfection, psychological well-being, moral education
Abu Raykhon Beruni	Hindistan, Monuments from Ancient Peoples	Truthfulness, Scientific Integrity, Justice	Scientific Objectivity, Research Ethics, Fidelity to Facts

Scholar	Works	Main Ethical Ideas	Contemporary Relevance
Yusuf Khos Khajib	Qutadghu Bilig	Moral Responsibility Between Leader and People, Justice, Counsel, Patience	Ethics in State Governance, Culture of Service, Responsible Leadership

Research Results

This table presents how the ethical views of these thinkers were formed in different aspects and highlights their relevance today. It is evident that their works not only carry historical value but can also serve as practical guides for contemporary education, governance, social, and cultural spheres. Deep study and integration of these ideas into the upbringing of youth is one of the key directions for national development.

Ibn Sina (Avicenna) paid close attention to the classification of sciences in his era and authored the work *Aqsam al-Ulum al-Aqliya* ("Classification of the Rational Sciences"). In it, practical philosophy is divided into three parts—ethics, economics, and politics. The first part addresses the moral and behavioral conduct of an individual; the second concerns interpersonal relations within the family and household; and the third part explores broader social interactions. Each category is further subdivided into specialized branches. The text discusses 29 fields of knowledge and emphasizes that true ethical virtues and an ideal society are attainable in this world, through mutual assistance among people. He stresses that society must be governed according to just laws agreed upon by its members, with compliance by all. Any violations of the law or injustice should be punished. Moreover, if a ruler himself acts unjustly, the people have the right to resist, and such resistance should be supported by society. Ibn Sina's ethical ideas particularly highlight essential moral qualities in daily life, such as humility, respect, courage, honesty, and sincerity [11].

Abu Rayhan Beruni also discussed honesty and falsehood in his writings. He noted that lies arise from ill intentions or anger, and sometimes people spread false information either to please those they favor or to harm those they dislike. Others lie due to a lowly disposition, seeking personal gain or avoiding misfortune. Some individuals spread falsehoods out of habit, as if it were their duty. Beruni argues that those who adhere to truthfulness, avoiding lies, should be respected, while habitual liars, even if admired by others, are morally corrupt. He emphasized: "Speak the truth even if it harms you." Valor, commonly understood as courage on the battlefield or avoidance of danger, is a form of moral excellence, but the highest form is the ability to speak the truth or act rightly without fear of death. Truthfulness is innately valued and desired by all, but those who have not experienced its sweetness or refuse it do not love it. Therefore, lying diverts a person from justice and leads to other vices such as oppression, false testimony, betrayal of trust, theft, and acts that harm society [12].

Abu Nasr al-Farabi, in his works, spoke about the ideal, complete human being and interpreted the concept of ethics in a broad sense. He emphasized that all people, regardless of religion, belief, race, or language, should strive for harmony and cooperation. He envisioned forming a single, unified human community in the world, where the interests of all citizens are equally considered and acted upon. Al-Farabi, describing the model of an enlightened and morally mature person, wrote: *"Whoever seeks to study wisdom should begin from youth, be physically healthy, possess good morals and etiquette, be truthful in speech, refrain from evil deeds, know all*

laws and regulations, respect the learned and eloquent, generously support knowledge and scholars, and acquire knowledge of all tangible things in the world." [13]

From this, it is clear that al-Farabi paid particular attention to the intellectual and moral education of youth. In his view, knowledge and enlightenment must always be complemented by good ethics; without them, the intended goal of cultivating a fully developed individual cannot be achieved. Scholars such as al-Farabi, Ibn Sina, al-Biruni, and Yusuf Khass Khajib approached ethical issues with a profound philosophical, religious, and social perspective. One notable aspect is that they considered ethics not merely as personal cultivation but in connection with the development of the entire society. For instance, al-Farabi combined ethical excellence with governance through his concept of the "virtuous city," illustrating that moral development and state administration are inseparably linked—a principle that remains relevant for contemporary governance.

Another key point is their integration of ethics with knowledge. Ibn Sina and al-Biruni not only wrote about moral virtues but explained them using scientific reasoning, linking them to human health, intellectual clarity, and societal justice. Their approach aligns closely with modern scientific-ethical principles. A third aspect is found in Yusuf Khass Khajib's *Qutadghu Bilig*, where ethical standards play a central role in the relationships among rulers, advisors, and the populace. This highlights the continued importance of values such as responsibility, justice, and patience in social governance today. Overall, the ethical views of these thinkers represent a harmonious synthesis of scientific thought, Eastern wisdom, Turkic philosophical traditions, and contemporary pedagogical ideas. Their legacy is not only historically significant but also serves as a foundational component of modern education and moral formation.

Conclusion and Recommendations

The ethical heritage of Central Asian thinkers from the 9th–12th centuries provides a solid foundation for cultivating values such as moral integrity, patriotism, honesty, knowledge-seeking, and justice among today's youth in Uzbekistan. Their works, when deeply applied within the education system, are crucial for fostering a morally enlightened society. Scholars such as Abu Nasr al-Farabi, Ibn Sina, Abu Rayhan al-Beruni, and Yusuf Khass Khajib approached ethical issues in direct connection with societal development, scientific inquiry, human perfection, state governance, and moral education. In their works, ethics was not merely a matter of individual morality or personal conduct, but was regarded as a fundamental foundation for political, social, and spiritual development within society. The following key conclusions can be drawn from their contributions:

- **Al-Farabi** promoted the idea of the "virtuous person" and the concept of the virtuous state as the basis for establishing an ethical society;
- **Ibn Sina** linked ethics to personal discipline and human health, analyzing it on philosophical and medical grounds;
- **Al-Beruni** emphasized scientific integrity and truthfulness as essential ethical values;
- **Yusuf Khass Khajib** connected ethical principles to state governance, justice, leadership responsibilities, and provided practical guidance for rulers.

In summary, these thinkers constitute a vital part of the heritage of Central Asian ethical thought. Their ideas were relevant not only in their own time but remain highly significant today, especially in the context of building a "New Uzbekistan." They provide guidance for reforming the moral and spiritual sphere, nurturing young generations, promoting ethical maturity in society, and

integrating national values into the education system. Therefore, a deep study, dissemination, and practical implementation of their rich ethical legacy is considered not only a scholarly task but also a crucial moral and educational duty.

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DIGITALIZATION TRENDS IN THE DEVELOPMENT OF WOMEN'S LEADERSHIP POTENTIAL

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Abstract. *This article analyzes the role of digitalization in developing women's leadership potential, with particular attention to female students and young women in higher education. In contemporary society, leadership is no longer formed only through face-to-face participation, formal administrative positions, or traditional public activity. Digital learning platforms, online communication environments, virtual collaboration tools, social networks, and project-based digital spaces have created new conditions in which women can express initiative, build confidence, communicate with wider audiences, coordinate group activity, and participate in decision-making processes. The purpose of the article is to clarify how digitalization contributes to the formation of women's leadership competencies and to identify the socio-psychological mechanisms through which this process becomes visible in educational and social practice. The study is based on a qualitative analytical design that synthesizes pedagogical, psychological, and digital education perspectives. The findings show that digitalization strengthens leadership potential through four interconnected dimensions: digital competence, communicative visibility, collaborative responsibility, and reflective self-development. The article argues that digital tools become effective for leadership development only when they are combined with pedagogical support, mentoring, a psychologically safe learning environment, and opportunities for practical social participation. The results have scientific and practical significance for universities, educators, mentors, and policy makers seeking to promote women's leadership, social activity, and professional growth in a digitally transforming society.*

Keywords: *women, female students, leadership potential, digitalization, digital competence, digital education, social activity, management skills, communicative competence, mentoring, personal development.*

1. Introduction

Globalization, the rapid exchange of information, and the penetration of digital technologies into nearly every sphere of social life have made the development of human capital one of the central priorities of modern education. In this context, the participation of women in social, political, economic, and educational processes is not simply a question of formal equality. It is also a question of how societies identify, support, and develop the intellectual, communicative, managerial, and creative capacities of women. The development of women's leadership potential is therefore closely connected with the quality of education, the openness of social institutions, the strength of civic participation, and the ability of young people to act responsibly in a changing digital environment.

The issue is especially important for female students. Student years are a sensitive period in which professional identity, self-confidence, communicative behaviour, value orientation, and social responsibility are actively formed. At this stage, a young woman may begin to see herself not only as a learner, but also as an organizer, adviser, initiator, volunteer, researcher, project

participant, or future manager. However, leadership potential does not emerge automatically. It develops gradually through educational influence, social experience, successful communication, reflective practice, and participation in meaningful activity. When such activity is supported by digital tools, the opportunities for leadership development become wider and more flexible.

The original meaning of leadership has also changed under the influence of digitalization. In the past, leadership was often associated with visible authority, public speaking, organizational hierarchy, or direct management of a group. Today, leadership can also appear in online collaboration, digital project coordination, educational content creation, virtual mentoring, civic media activity, and the ability to mobilize people around a shared idea through digital communication. A female student who coordinates a group task in an online platform, leads a volunteer campaign through social media, moderates a digital discussion, or creates educational resources for peers is already performing important leadership functions. These forms may not always be recognized as formal leadership, but they shape the same core qualities: initiative, responsibility, decision-making, communication, planning, cooperation, and accountability.

International evidence shows that gender equality in education has improved in many countries, but women remain underrepresented in leadership positions. OECD indicator data show that young women are often highly represented among people with tertiary education, while global leadership data still reveal gaps in women's access to senior roles. The World Economic Forum's 2025 analysis also indicates that younger women are entering leadership roles more actively than older generations, but structural barriers continue to limit full parity. UNESCO's work on leadership in education similarly emphasizes that leadership systems must become more inclusive if education is to benefit from the talent and experience of women. These tendencies demonstrate that the development of leadership potential among women is not only a pedagogical issue, but also a social, psychological, and institutional problem.

In Uzbekistan, ongoing reforms in education and social development have increased attention to the personal and professional growth of young people, including female students. Higher education institutions are expected not only to provide knowledge, but also to cultivate civic responsibility, social initiative, communicative culture, and the ability to participate constructively in public life. In this regard, digitalization can serve as an innovative approach to strengthening women's leadership potential. Digital platforms can give female students access to learning materials, professional networks, mentoring opportunities, research communities, volunteer initiatives, start-up projects, and public communication channels. At the same time, digitalization can reproduce inequality if access, digital literacy, confidence, and institutional support are unevenly distributed.

The problem addressed in this article is therefore the following: how does digitalization contribute to the development of women's leadership potential, and what socio-psychological conditions make this contribution effective? The aim of the article is to analyze the digitalization trend in women's leadership development and to identify practical directions for using digital tools in educational settings. The article focuses on leadership potential as an integrated set of personal qualities that includes initiative, responsibility, communicative activity, reflexivity, strategic thinking, emotional stability, social confidence, and the ability to cooperate with others. The article treats digitalization not as a simple technical process, but as a transformation of learning, communication, participation, and self-expression.

2. Materials and Methods

The study used a qualitative analytical design. Since the purpose was not to test a statistical hypothesis, but to clarify the conceptual relationship between digitalization and women's leadership potential, the article relied on analysis, comparison, synthesis, and pedagogical interpretation. The analytical material included psychological and pedagogical views on leadership development, studies on communication and personal growth, and current discussions of digital education, gender equality, and educational leadership. The original Uzbek-language manuscript served as the conceptual source text, and its main ideas were translated, reorganized, and expanded into an IMRAD structure.

The methodological logic consisted of four stages. First, the key concepts were defined: leadership potential, digitalization, digital competence, communicative competence, social activity, and management skills. Second, the article identified the main environments in which digital leadership may appear: learning management systems, online communication platforms, virtual teamwork, social media, digital mentoring, start-up spaces, and volunteer networks. Third, the relationship between these environments and leadership qualities was analyzed. This stage focused on how specific digital activities may support initiative, independent decision-making, public communication, group coordination, and reflective self-evaluation. Fourth, the findings were synthesized into a practical model for universities and educators.

The study is conceptual rather than empirical. This means that the results should be understood as analytical findings that can guide future empirical research, curriculum design, mentoring programs, and institutional policy. The article does not claim that digital technologies automatically produce leadership. Instead, it assumes that digital tools become educationally meaningful when they are used purposefully, supported by teachers and mentors, and connected with real social or professional tasks. This methodological position is important because technology alone cannot replace psychological support, ethical education, interpersonal trust, or institutional encouragement.

3. Results

The analytical synthesis produced four main results. These results explain how digitalization can strengthen women's leadership potential and under what conditions it can become a productive educational trend. The findings are presented as interrelated dimensions rather than isolated factors because leadership development is a complex process that includes knowledge, behaviour, identity, communication, and social recognition.

Digital competence as a foundation for leadership

The first result is that digital competence functions as a foundation for modern leadership. A woman who can search for information critically, use digital platforms, communicate online, prepare digital content, organize documents, manage virtual meetings, and protect her digital identity gains practical independence. This independence is directly connected with leadership potential because it allows her to participate actively rather than passively consume information. Digital competence also reduces dependence on others in academic and professional tasks. For female students, this may mean the ability to lead a group presentation through a shared platform, prepare a project plan, collect data through online forms, communicate with partners, or present the results of a social initiative to a broader audience. In each case, digital competence becomes a tool for initiative and responsibility.

Communicative visibility and confidence

The second result is that digitalization increases communicative visibility. Traditional classroom communication may be limited by time, space, hierarchy, or social hesitation. Some

female students may be reluctant to speak in public, especially in contexts where gender stereotypes or fear of criticism are strong. Digital communication can create alternative channels for expression. Online forums, group chats, educational blogs, webinars, and social media pages allow women to formulate ideas, ask questions, share materials, and receive feedback. This does not mean that online communication is always easier or safer, but it can provide additional spaces for gradual confidence building. When female students see that their ideas receive attention and produce results, their leadership identity becomes stronger.

Table 1. Digital leadership development matrix for women and female students

Digital component	**Leadership competence supported**	**Socio-psychological mechanism**	**Institutional application**
Digital literacy and platform use	Independence, planning, information management	Reduction of dependence and growth of self-efficacy	Training on learning platforms, online research, document management
Online communication spaces	Public expression, dialogue, persuasive communication	Confidence through repeated expression and feedback	Discussion forums, webinars, digital debate clubs, moderated group chats
Virtual teamwork and project tools	Coordination, responsibility, decision-making, conflict resolution	Accountability through visible roles and deadlines	Group projects, social campaigns, start-up tasks, volunteer coordination
Digital mentoring and role models	Professional aspiration, leadership identity, resilience	Identification with successful women and guided reflection	Mentor meetings, alumni networks, peer leadership circles
Digital portfolios and reflective tools	Self-evaluation, strategic growth, emotional regulation	Transformation of activity into conscious experience	Reflective journals, evidence portfolios, peer evaluation forms

Note. The matrix presents an analytical synthesis of digital tools, leadership competencies, psychological mechanisms, and possible university practices.

Collaborative responsibility in virtual projects

The third result is that digital platforms can develop collaborative responsibility. Leadership is not only the ability to give instructions; it is also the ability to organize cooperation, listen to others, divide tasks fairly, solve conflicts, and complete shared work. Virtual projects require planning, time management, coordination, written communication, and accountability. These are precisely the skills that form the behavioural side of leadership. For example, when

students prepare a digital campaign on environmental awareness, women's rights, language learning, or community service, they may distribute roles, manage deadlines, design materials, contact participants, and evaluate results. The digital environment records many of these actions, making responsibility more visible and measurable.

Reflection, self-development, and leadership identity

The fourth result is that digitalization supports reflection and self-development. Leadership potential grows when a person can evaluate her own strengths, limitations, communication style, emotional responses, and decision-making patterns. Digital portfolios, reflective journals, recorded presentations, peer feedback forms, and online mentoring conversations can help female students observe their progress over time. Reflection transforms activity into experience. Without reflection, a student may complete many tasks but fail to understand how these tasks have changed her confidence, communication, or leadership behaviour. With reflection, she begins to connect action with personal growth and social responsibility. This is why digital leadership development should include reflective assignments, guided feedback, and mentoring discussions.

Table 1 summarizes the main connections between digital tools and leadership competencies. The table shows that digitalization should not be reduced to the use of devices. Its educational value lies in the way tools are connected with psychological mechanisms and institutional practices.

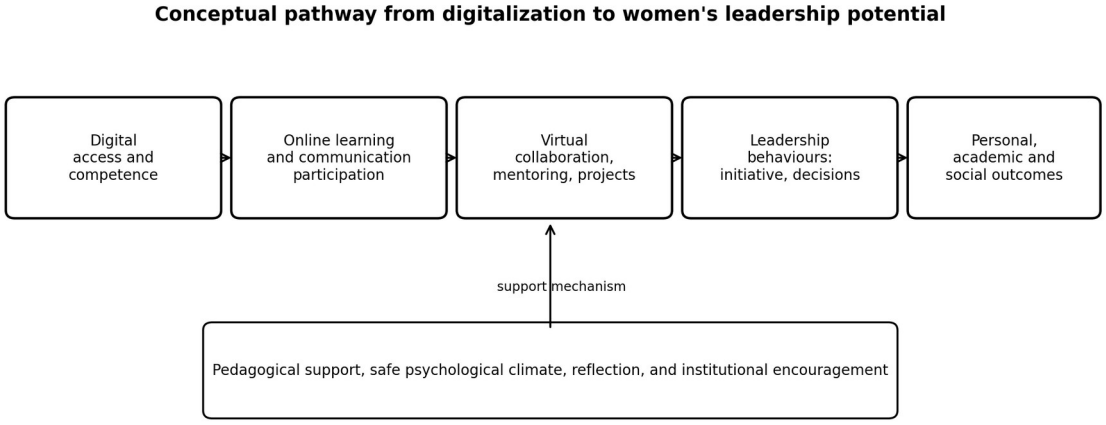


Figure 1. Conceptual model of digitalization and women's leadership potential

4. Discussion

The results show that digitalization can become a powerful trend in developing women's leadership potential, but only if it is understood in a broad pedagogical and socio-psychological sense. Digitalization is sometimes interpreted narrowly as the introduction of computers, internet access, or online platforms into education. Such a view is incomplete. A platform does not develop leadership by itself. Leadership emerges when a learner uses that platform to communicate, organize, create, decide, cooperate, and reflect. Therefore, the central question is not whether technology exists, but how it is used in the educational environment.

The first implication concerns the role of teachers and mentors. If female students are expected to develop leadership through digital activity, educators must create tasks that require initiative rather than mechanical completion. For example, a simple online test may measure knowledge, but it does not necessarily build leadership. In contrast, a digital project that asks students to identify a social problem, organize a small team, create educational content,

communicate with a target audience, and present outcomes can develop leadership qualities. Mentor feedback is especially important because young women may need encouragement to interpret their own activity as leadership. Many capable students do not call themselves leaders because they associate leadership with formal authority. A mentor can help them recognize that organization, responsibility, problem-solving, and social contribution are also leadership behaviours.

The second implication concerns psychological safety. Digital spaces can encourage participation, but they can also expose women to criticism, comparison, harassment, or self-doubt. Therefore, universities must create ethical norms for digital communication. Respectful feedback, protection from humiliation, responsible use of social media, and clear rules for online teamwork are necessary conditions. If the digital environment is unsafe, it may reduce confidence instead of strengthening leadership. A supportive climate allows female students to experiment, make mistakes, correct them, and continue developing.

The third implication concerns gender stereotypes. In many societies, women may still face explicit or hidden expectations about modesty, obedience, family roles, or limited public visibility. These expectations can influence whether a young woman feels entitled to lead, speak, organize, or make decisions. Digitalization may weaken some stereotypes by giving women access to wider networks and alternative models of success. However, it may also reproduce stereotypes if online spaces are dominated by the same unequal attitudes found offline. For this reason, digital leadership programs should include gender-sensitive mentoring, examples of successful women leaders, discussion of social barriers, and opportunities for women to practice public communication in constructive settings.

The fourth implication concerns institutional policy. Higher education institutions should not treat women's leadership development as an occasional event or a ceremonial activity. It should be integrated into curricula, extracurricular programs, student self-governance, research projects, volunteer initiatives, and start-up ecosystems. Digital platforms can connect these activities and make participation more systematic. For instance, a university may create a digital leadership portfolio in which female students record projects, roles, certificates, reflective notes, peer evaluations, and mentoring outcomes. Such portfolios can help students see their own growth and can also help institutions identify emerging leaders.

The fifth implication concerns the balance between personal development and social contribution. Leadership potential is not only a personal advantage; it is also a resource for society. When women develop digital leadership skills, they can contribute to education, community development, family well-being, entrepreneurship, public health, environmental awareness, and cultural life. Digital tools make it possible for even small initiatives to reach larger audiences. A student who creates a digital literacy workshop for younger girls, organizes an online volunteer group, or publishes educational materials in her native language contributes to social progress while developing her own leadership identity.

At the same time, the analysis has limitations. Because the study is conceptual, its results should be tested through empirical research. Future studies may survey female students, observe digital project work, interview mentors, compare institutions, or measure changes in leadership self-efficacy before and after digital training programs. Quantitative studies could examine how digital competence predicts leadership confidence, while qualitative studies could explore how women describe their experiences of online initiative and public visibility. Mixed-methods

research would be especially useful because leadership potential includes both measurable skills and subjective identity formation.

Overall, the discussion confirms that the digitalization of women's leadership potential is an innovative and socially significant direction. It connects educational modernization with gender equality, personal growth with institutional development, and technological competence with civic responsibility. The most effective model is not technology-centered, but learner-centered and value-centered. Digital tools should serve the development of confidence, communication, responsibility, cooperation, and ethical social participation.

5. Conclusion

The development of women's leadership potential in the digital age is a complex pedagogical, psychological, and social process. Digitalization creates new opportunities for female students and young women to participate in learning, communication, collaboration, mentoring, project activity, and public initiatives. These opportunities can strengthen leadership qualities such as initiative, independence, responsibility, communicative confidence, strategic thinking, emotional stability, and the ability to work with a team.

The article has shown that digitalization contributes to women's leadership development through four main dimensions: digital competence, communicative visibility, collaborative responsibility, and reflective self-development. However, the positive influence of digitalization depends on the presence of pedagogical support, safe psychological climate, gender-sensitive mentoring, meaningful project work, and institutional encouragement. Without these conditions, digital tools may remain superficial or may even reproduce existing inequalities.

For universities and educators, the practical conclusion is clear: digital leadership development should be planned, supported, and evaluated. Female students should be given opportunities to lead digital projects, participate in online communities, create educational content, receive mentoring, reflect on their growth, and connect leadership activity with real social needs. Such an approach can help transform digitalization from a technical process into a human-centered mechanism of personal and professional development. In this sense, the digitalization trend in women's leadership potential has important scientific and practical significance for modern education and for the broader development of society.

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Contents

13.00.00 PEDAGOGICAL SCIENCES

A.A. Ibragimov, K.R. Suvanova
DEVELOPMENT OF PROFESSIONAL UNITY AND A HEALTHY PSYCHOLOGICAL ATMOSPHERE THROUGH JOINT TRAINING OF TEACHERS BASED ON ART-PEDAGOGY 4

I. Toshpulatova
DIDACTIC OPPORTUNITIES FOR DEVELOPING CREATIVE COMPETENCE BASED ON THE INTEGRATION OF DEVELOPMENT CENTERS IN THE PRESCHOOL EDUCATIONAL ENVIRONMENT 9

A.Sh. Mukhamadiyev, N.Z. Nomozova
EXPERIENCE IN APPLYING INNOVATIVE TECHNOLOGIES IN THE EDUCATIONAL PROCESS OF TECHNICAL UNIVERSITIES 14

S.A. Rasulova
DEVELOPMENT OF ORTHOGRAPHIC AWARENESS THROUGH THE INTEGRATION OF VOCABULARY WORK AND HANDWRITING PRACTICE 19

O.H. Olimjonova
THE CURRENT STATE OF IMPROVING THE QUALITY AND EFFECTIVENESS OF EDUCATION IN THE MANAGEMENT OF PRESCHOOL EDUCATIONAL ORGANIZATION LEADERS 24

N.Y. Rustamova
HISTORICAL AND PEDAGOGICAL FOUNDATIONS OF THE FORMATION OF READING CULTURE IN FAMILIES 30

Z.Sh. Suyarova
THE EFFECTIVENESS OF FLIPPED CLASSROOM IN INTERACTIVE ENGLISH LANGUAGE TEACHING 36

N.K. Murtazayeva
IMPROVING THE METHODOLOGY OF TEACHING BIOCHEMISTRY IN HIGHER MEDICAL EDUCATION INSTITUTIONS BASED ON INNOVATIVE TECHNOLOGIES 41

G. Abdiraimova
THE CONCEPTUAL ESSENCE OF COGNITIVE ACTIVITY AND ITS PSYCHOLOGICAL-PEDAGOGICAL FOUNDATIONS 46

M.S. Akhmadjanova
APPLICATION OF EDUCATIONAL METHODS IN TEACHING BIOLOGICAL SCIENCES 50

G.A. Ganiyeva
INNOVATIVE APPROACHES TO WORKING WITH TEXT IN IMPROVING THE METHODOLOGICAL PREPARATION OF FUTURE PRIMARY SCHOOL TEACHERS 56

Yu. A. Gerasimova, I.V. Egorov
PSYCHOLOGICAL AND PEDAGOGICAL ANALYSIS OF THE RELATIONSHIP BETWEEN FAMILY UPBRINGING AND THE DEVELOPMENT OF A CHILD'S EMOTIONAL INTELLIGENCE 61

Z.X. Mahmudova
THE PEDAGOGICAL PROFESSION AND ITS PROFESSIONAL COMPETENCIES 64

Sh.M. Sultonova
MECHANISMS FOR PREPARING DIRECTORS OF PRESCHOOL EDUCATIONAL ORGANIZATIONS FOR STRATEGIC MANAGEMENT 71

A.O. Hakimov
SPECIFIC CHARACTERISTICS OF EDUCATIONAL ENVIRONMENT DEVELOPING READING LITERACY IN PREPARATORY GROUP CHILDREN 75

D. Alimukhamedova, L. Altaeva, A. Danshova, A.O. Dosmurzaeva
ETHICAL AND PEDAGOGICAL ASPECTS OF ARTIFICIAL INTELLIGENCE APPLICATION IN INCLUSION: THE BALANCE BETWEEN TECHNOLOGY AND HUMAN INTERACTION 81

N.U. Absalomova, A.Sh. Ziyovuddinova, M. Mahammadjonova
THE ROLE OF NEUROPSYCHOLOGICAL METHODS IN SPEECH TERAPHY WORK 85

U.R. Akhunov
METHODOLOGICAL FOUNDATIONS FOR IMPROVING STUDENTS' KINESTHETIC DEVELOPMENT DURING THEIR PREPARATION FOR PROFESSIONAL ACTIVITIES 90

S.B. Muxammadiyeva
PSYCHOCORRECTION OF THE FUNCTIONAL STATE OF THE BRAIN IN PRIMARY SCHOOL PUPILS BASED ON AN ERGONOMIC APPROACH 93

U.A. Nasritdinova
ANALYSIS OF PEDAGOGICAL AND PSYCHOLOGICAL FACTORS IN THE GRAPHIC SCIENCES STUDY PROCESS IN HIGHER EDUCATION INSTITUTIONS 100

A.Zh. Kalykbayeva, G.A. Daukenova
ORGANIZATION OF AN EXPERIMENTAL STUDY WITH CHILDREN AGED 5-7 WITH AUTISM SPECTRUM DISORDER 106

A.L. Nam
TRANSFORMATION OF BACHELOR'S DEGREE PROGRAMS IN THE TRANSPORT SECTOR IN THE CONTEXT OF THE SUSTAINABLE MOBILITY CONCEPT (CASE OF UZBEKISTAN) 113

A.A. Madraximov
PLANTING A TREE IS PLANTING HOPE FOR THE FUTURE 119

S.Kh. Daminova
DIDACTIC FEATURES OF PISA TASKS AND THE METHODOLOGY OF THEIR APPLICATION IN PHYSICS EDUCATION 124

M.Kh. Bakhrinova 130

DEVELOPING INTUITIVE COGNITION IN STUDENTS THROUGH CREATIVE TEXT PRODUCTION: A PEDAGOGICAL MODEL.....
U.F. Abdurahmonova
DEVELOPING COMMUNICATION SKILLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER THROUGH ALTERNATIVE AND AUGMENTATIVE COMMUNICATION TOOLS..... 134
M.J. Jo‘rabayeva
THE ROLE OF “MUSIC CULTURE” LESSONS IN DEVELOPING ARTISTIC AND CREATIVE ABILITIES OF PRIMARY SCHOOL STUDENTS..... 138
M.J. Jo‘rabayeva
AN ANALYSIS OF INTERNATIONAL PRACTICES IN THE DEVELOPMENT OF ARTISTIC AND CREATIVE ABILITIES OF PRIMARY SCHOOL STUDENTS THROUGH CHILDREN’S FOLKLORE..... 142
O.V. Zavalishina, Zh.Ak. Abenova
THE USE OF BEHAVIOR CHAINING IN DEVELOPING SELF-CARE SKILLS IN CHILDREN WITH AUTISM SPECTRUM DISORDER.. 145
S.Yu. Ashurova, N.N. Karimova
PEDAGOGICAL AND PSYCHOLOGICAL CHARACTERISTICS OF THE FORMATION OF CONTINUOUS PROFESSIONAL COMPETENCES IN TECHNICAL SCHOOL STUDENTS DURING THE EDUCATIONAL PROCESS..... 156
Z.A. Ismatova, A.A. Urokova
THE IMPORTANCE OF NATURAL SCIENCES IN DEVELOPING CREATIVITY AMONG PRIMARY SCHOOL TEACHERS..... 162
F.K. Khaytova
CORRECTIVE-PEDAGOGICAL MECHANISM FOR SPEECH DISORDERS IN CHILDREN WITH VISUAL IMPAIRMENTS..... 166
N.I. Murodova, M.V. Bylino, Z.M. Akhmedova
ENHANCING THE PROFESSIONAL COMPETENCIES OF TEACHERS IN THE PROCESS OF IMPLEMENTING INCLUSIVE EDUCATION IN UZBEKISTAN..... 172
K.A. Toshmatova, H.H. Botirov
PEDAGOGICAL AND ORGANIZATIONAL CAPABILITIES OF ARTIFICIAL INTELLIGENCE..... 175
M.M. Turdimurodova
THE PROFESSIONAL COMPETENCE OF TEACHERS IN INCLUSIVE EDUCATION AND THE ROLE OF MOTIVATION IN STUDENTS’ SOCIAL ADAPTATION..... 179
E.T. Djurabekov, K.R. Davidova
FORMS OF PHYSICAL EDUCATION AND SPORTS ACTIVITIES IN EDUCATIONAL INSTITUTIONS..... 184
E.R. Shirayeva
INNOVATIVE MECHANISMS OF MEDIA CULTURE IN THE PATRIOTIC EDUCATION OF MILITARY PERSONNEL..... 188
G.R. Samadkulova
A METHODOLOGICAL MODEL FOR IMPROVING THE SOCIO-HISTORICAL COMPETENCIES OF ENGINEERING STUDENTS BASED ON DIGITAL TECHNOLOGIES..... 193
G.B. Toremuratova
METHODOLOGICAL OPPORTUNITIES FOR DEVELOPING A SENSE OF NATIONAL IDENTITY IN ADOLESCENTS THROUGH HISTORICAL KNOWLEDGE..... 197
N.A. Tursunboyeva
THE USE OF PROJECT-BASED ACTIVITIES IN MECHANICS LABORATORY LESSONS..... 201
P.S. Djurayeva
METHODOLOGY FOR DEVELOPING STUDENTS' CREATIVITY ORIENTED IN LEARNING RESEARCH AND DESIGN IN CLASSROOMS AND OUT-OF-CLASS ACTIVITIES BASED ON STEAM EDUCATION..... 206
D.I. Djumayeva
THE ROLE OF THE TEACHER'S PERSONALITY IN DEVELOPING EMOTIONAL LEADERSHIP IN PRIMARY SCHOOL CHILDREN… 213
E.S. Tukhtaeva
PRINCIPLES AND REGULATORY FRAMEWORK OF INCLUSIVE EDUCATION IN THE REPUBLIC OF UZBEKISTAN..... 220
Z.A. Ulugov
THE ROLE OF STRATEGIC MANAGEMENT IN THE DEVELOPMENT OF CORPORATE GOVERNANCE CULTURE IN HIGHER EDUCATION INSTITUTIONS..... 223
X.B. Usmanova
THE ROLE OF THE OLIGOPHRENOPEDAGOGUE IN THE SOCIAL INTEGRATION OF CHILDREN WITH SPECIAL EDUCATIONAL NEEDS..... 230
D.A. Orozboyeva
METHODOLOGICAL REQUIREMENTS FOR ORGANIZING SYNTACTIC EXERCISES..... 234
M.B. Radjabova
PRINCIPLES OF A METHODOLOGY FOR DEVELOPING HISTORICAL ANALYSIS SKILLS AMONG ACADEMIC LYCEUM STUDENTS BASED ON UNIVERSAL HUMAN VALUES..... 242
L.Sh. Shukurova
METHODOLOGICAL FOUNDATIONS FOR DEVELOPING STUDENTS’ SPEECH THROUGH THE INTEGRATION OF NATIVE LANGUAGE AND READING LITERACY SUBJECTS IN PRIMARY GRADES..... 248
Raximova Ra’noxon Ne’matjon qizi
DEVELOPING ALGORITHMIC THINKING AMONG 5TH–6TH GRADE STUDENTS THROUGH DIGITAL LEARNING PLATFORMS IN PROGRAMMING EDUCATION..... 252
Ergasheva Saida Avazovna
DEVELOPING CULTURE AND ARTS MANAGEMENT IN UZBEKISTAN: A CONCEPTUAL FRAMEWORK FOR EDUCATION, ENTREPRENEURSHIP, DIGITALIZATION, AND INSTITUTIONAL GOVERNANCE ……..… 266
Xaitboyev Dilshod Sotimboy ugli 272

CHEMISTRY EDUCATION AS A FOUNDATION FOR PROFESSIONAL COMPETENCE IN MEDICAL HIGHER EDUCATION: A CONCEPTUAL REVIEW AND FRAMEWORK……

Normurodov Akbar Doniyarovich
IMPROVING SOFTWARE FOR ASSESSING AND DEVELOPING STUDENTS' DESIGN COMPETENCE BASED ON DIGITAL IDENTIFICATION AND MONITORING TECHNOLOGIES…….. 283

Elmirzayeva Muslima Mirsalimovna
AN EVIDENCE-INFORMED DIGITAL-TECHNOLOGY-MEDIATED MODEL AND METHODOLOGICAL SYSTEM FOR DEVELOPING LANGUAGE ASPECTS OF PRE-SERVICE FOREIGN LANGUAGE TEACHERS…….. 294

Mukhiddinova Nafisa Safaralievna
THE RIGHT TO CHOOSE IN THE POLITICAL SOCIALIZATION OF YOUTH…….. 305

Shoxista Maxammatovna Sindarova
IMPROVING SOFTWARE SOLUTIONS FOR DEVELOPING STUDENTS' DESIGN COMPETENCIES USING ADVANCED CAD SYSTEMS IN HIGHER EDUCATION…….. 310

Esanova Gulchehra Boybo‘ri qizi
EFFECTIVENESS OF PEDAGOGICAL CONDITIONS FOR FORMING HEALTHY LIFESTYLE VALUES IN FEMALE UNIVERSITY STUDENTS THROUGH PHYSICAL EDUCATION…….. 328

Sultonova O‘g‘ilxon Sobirjonovna
WAYS OF USING ARTISTIC AND PEDAGOGICAL LITERATURE TO DEVELOP THE PROFESSIONAL AND AESTHETIC CULTURE OF FUTURE TEACHERS…….. 335

Feruzakhon Kh. Rasulova
DEVELOPING DIGITAL COMPETENCY OF PRE-SERVICE INFORMATICS TEACHERS THROUGH MOBILE TECHNOLOGY-BASED ELECTRONIC LEARNING RESOURCES: AN INTEGRATED CONCEPTUAL FRAMEWORK..... 341

Shakhrizoda Gofurova
THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR DEVELOPING PRE-SERVICE PRIMARY SCHOOL TEACHERS' SKILLS IN USING CONCEPTUAL TABLES AND GRAPHIC ORGANIZERS IN MOTHER TONGUE LANGUAGE EDUCATION…… 350

Shermuhamadova Diyoraxon Nurmuhamad qizi
ENHANCING THE MODEL FOR TEACHING MEDICAL TERMINOLOGY IN ENGLISH TO FUTURE PHYSICIANS…… 363

Islamova Durdonakhon, INTERACTIVE INSTRUCTIONAL STRATEGIES FOR TEACHING THE HISTORY OF PEDAGOGY BASED ON JADID HERITAGE IN A DIGITAL LEARNING ENVIRONMENT…… 366

Samatova Dilrabo
IMPROVING PSYCHOLOGICAL REHABILITATION FOR WOMEN RETURNING FROM PENAL INSTITUTIONS BY ACTIVATING PERSONAL RESOURCES..... 385

Shakhbos E. Davronov, Siddik K. Kakhkhorov
ASSESSING MEDICAL STUDENTS' PROFESSIONAL DIGITAL COMPETENCE: CRITERIA, INDICATORS AND DIAGNOSTIC TOOLS. 390

Dilshodakhon Khabibjon kizi Makhkamova
PEER REVIEW AS A FACTOR IN IMPROVING THE QUALITY OF DIGITAL RESOURCES CREATED BY UNIVERSITY STUDENTS….. 399

Shabbazova Nodira Xamzayevna
PEDAGOGICAL OPPORTUNITIES FOR DEVELOPING STUDENTS’ DIDACTIC CREATIVITY IN THE CONTEXT OF A PEDAGOGICAL EDUCATION CLUSTER..... 405

Feruza Saidazimova Rustam kizi
THE ROLE OF PR COMMUNICATIONS IN THE USE OF DIGITAL TECHNOLOGIES IN EDUCATION..... 414

Zulfiya Abutova
METHODOLOGICAL ASPECTS OF USING DIGITAL EDUCATIONAL TECHNOLOGIES IN RUSSIAN LANGUAGE LESSONS..... 419

Qosimov Jahongir Avlaqulovich
CONCEPTUAL APPROACHES TO ENHANCING EDUCATORS’ PROFESSIONAL ACTIVITIES THROUGH DIGITAL EDUCATIONAL TECHNOLOGIES..... 425

Komiljonova Mohinur Allabergan kizi
FROM CULTURAL SOURCES TO CLASSROOM JUDGEMENT: DEVELOPING PROSPECTIVE TEACHERS’ PROFESSIONAL CULTURAL STUDIES COMPETENCE..... 432

Sa’dullayev Avaz Akmal o‘g‘li
DIDACTIC OPPORTUNITIES OF DIGITAL TECHNOLOGIES FOR DEVELOPING STUDENTS’ PROGRAMMING COMPETENCE…….. 438

Eshpulatov Ma‘ruf Xolbek ugli
THRESHOLD GAINS AND THE ACTION GAP: RE-EXAMINING A DIALOGIC–REFLECTIVE METHODOLOGY FOR SPIRITUAL-MORAL COMPETENCE IN UZBEK LOWER-SECONDARY SCHOOLS..... 448

Ergasheva Shodiyaxon Eldor qizi
PROFESSIONAL COMPETENCE OF THE CLIL TEACHER AND COLLABORATION BETWEEN LANGUAGE AND SUBJECT TEACHERS IN DEVELOPING STUDENTS’ COMMUNICATIVE COMPETENCE..... 461

Djamol T. Pulatov
DEVELOPING PROFESSIONAL AND PERSONAL READINESS OF CADETS THROUGH AN INDIVIDUALIZED ADAPTIVE LEARNING MODEL..... 467

Zulfizar A. Saidova
DEVELOPING COGNITIVE COMPETENCES OF ACADEMIC LYCEUM STUDENTS THROUGH TRILINGUAL SOFTWARE IN MATHEMATICS: AN INTEGRATIVE APPROACH..... 476

Abduvaliyev Adxamjon Ismoilovich
BEYOND SHARED RUBRICS: OPPORTUNITY-SENSITIVE VALIDATION OF STUDENT TEACHERS’ MANAGEMENT CULTURE..... 488

Ergasheva Nigora Shamshidinovna 496

DEVELOPING 8TH GRADE LEARNERS' CRITICAL THINKING THROUGH MEDIA LITERACY AND EVALUATION OF ONLINE INFORMATION IN ENGLISH LESSONS.....

19.00.00 PSYCHOLOGICAL SCIENCES

Z.J. Kurbanova
DEVELOPMENT OF EMPATHY IN CHILDHOOD..... 501

N.N. Shodiyeva
INTERRELATIONSHIP BETWEEN GENDER-BASED PSYCHOLOGICAL CHARACTERISTICS OF MARITAL MOTIVES AND INDICATORS OF FAMILY STABILITY..... 510

22.00.00 SOCIOLOGICAL SCIENCES

S.S. Nuraliyev
POLITICAL PARTY IDEOLOGIES: PHILOSOPHICAL FOUNDATIONS AND THEIR ROLE IN MODERN SOCIETY..... 514

S.S. Nuraliyev
THE ESSENCE OF THE TRANSFORMATION OF POLITICAL PARTY IDEOLOGIES..... 519

N.Q. Mamadaliyev
MORAL ISSUES IN THE WORKS OF CENTRAL ASIAN THINKERS (IX–XII CENTURIES)..... 523

F.I. Yuldasheva
DIGITALIZATION TRENDS IN THE DEVELOPMENT OF WOMEN'S LEADERSHIP POTENTIAL..... 528

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