

FORMATION OF MATHEMATICAL COMPETENCE IN FUTURE PRIMARY SCHOOL TEACHERS IN THE EDUCATIONAL PROCESS

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Abstract. *The level of professional competence of teachers in mathematical training is largely determined by their ability to develop their creative potential and productively engage in self-improvement. The connection between a person's ability to self-development and the characteristics of his professional activity, the specific results of his activity allows us to consider professional self-improvement as an important area of training specialists, an obligatory element of professional activity.*

Keywords: *vocational guidance, school, college, education, training, preparation, plan, program.*

In pursuance of the Decree of the President of the Republic of Uzbekistan dated January 25, 2018 No. PD-5313 “On measures to radically improve the system of general secondary, secondary specialized and vocational education”:

Create a Center for Professional Education of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan (hereinafter referred to as the Center) on the basis of the Center for Secondary Specialized, Vocational Education of the Ministry of Higher and Secondary Specialized Education of the Republic of Uzbekistan.

Determine the main tasks and activities of the Center:

implementation of a unified state policy in the field of vocational education, together with ministries, departments, business associations, commercial banks and large enterprises that operate professional colleges, the implementation of medium- and long-term programs for the development of vocational education, the provision of organizational and methodological guidance for educational and educational process in professional colleges;

organizing the development of curricula and training programs in vocational colleges for mid-level specialists in demand on the labor market, based on the needs and proposals of employers and advanced foreign experience, as well as taking into account structural changes in the real sectors of the economy;

ensuring, on a systematic basis, work on the selection and staffing of professional colleges with highly professional managerial and pedagogical personnel, regular improvement of their qualifications and professional level, as well as stimulation of their work;

the introduction of new forms and methods of advanced training and retraining of the management and teaching staff of the system;

coordination of educational and methodological work of all professional colleges of the republic, regardless of their departmental affiliation;

development and implementation of measures aimed at improving the quality of education in professional colleges, continuous improvement of the educational process;

coordination and methodological support of the process of vocational education in specialized educational and production complexes for the formation of professional skills of students in grades 10-11 of general education schools;

Mathematics teachers note the following negative trends in the development of mathematics education: in connection with the transition to a two-level education system, the number of hours allocated to mathematics is reduced, while most students do not have independent work skills; the gap between the level of mathematical knowledge of school graduates and the requirements of universities is deepening; the gap between the level of mathematical knowledge of university graduates and the objective needs of modern science and technology is growing; proper methodological support for conducting classroom classes, control activities and independent work of students is not enough.

An analysis of the state of teaching mathematics that has developed at the moment in the system of higher professional education, carried out on the basis of studying publications, conversations with teachers and students, testing students, showed that, despite the fact that to date, the practice of preparing students in universities has accumulated considerable potential methods, forms and means of teaching mathematics, the traditional system of teaching remains the main one, in which the teacher acts mainly as an informant and controller of students.

The following pedagogical problems have been identified that arise in the traditional organization of education: the passivity of students in the classroom; low motivation to study; irregularity of classroom independent work; selective controllability of the results of the students' activities; inability to adapt to their individual characteristics.

Currently, there is an increased interest in the professionalism of pedagogical activity. This is due to the significant changes taking place in our society and in the system of higher professional education. At the same time, the high level of requirements for the future teacher dictates the need to find ways to solve the qualitative preparation of students for pedagogical activity, in particular, the creation of new approaches to the organization of various types of practices: educational (including camp training), production (the stages of which are pedagogical (including summer practice) and undergraduate practice)

Scientists and practitioners in the educational sphere are faced with the task of developing new ways to increase the efficiency of the educational process, which would allow it to be modernized, improve the quality of the knowledge gained and the skills and abilities of future teachers being formed. The study of the professional skills of teachers is aimed at formulating requirements for their activities, clarifying the goals of training at the university; without this, it is impossible to update the content of teaching students of a pedagogical specialty.

The entire learning process should solve the problem of the integrity of professional activity. To do this, it is necessary to direct it in the direction of the formation of "professional activity". (12).

"Under practice should be understood the totality of people's activities aimed at creating the necessary conditions for the existence of society" (A Brief Philosophical Dictionary). Practical activity at the university in pedagogical specialties is a test of students' readiness for future professional activities. Teachers during educational and pedagogical practices can see the "gaps" that exist in the preparedness of students, and thus make appropriate adjustments to the learning process. Therefore, the problem of forming the professional readiness of students in the process of various types of practices, the ability to teach functions is of particular relevance. This problem is

connected, first of all, with the fact that in the organization of the educational process, pedagogical practice is not continuous, but is included sporadically. Such a situation does not allow to effectively implement the principle of continuity between theory and practice, which, in terms of integrity, is implemented in the "teacher - student" system based on the integration of major disciplines.

To achieve this goal, the following tasks were formulated:

1. To study the essence of the concepts of "competence", "competence" and existing approaches to the formation of mathematical competencies among bachelors of a technical university;
2. To identify the features of the adaptive learning system and justify the possibility of its application in a technical university in order to form mathematical competencies among bachelors;
3. Determine the principles for the formation of mathematical competencies based on an adaptive learning system;
4. Based on the principles of the formation of mathematical competencies, formulate goals and select the content of the mathematical training of bachelors in a technical university;
5. To develop methods, means and forms of training aimed at the formation of mathematical competencies;
6. To identify criteria for assessing the levels of formation of mathematical competencies of bachelors of a technical university, on their basis to confirm the effectiveness of experimental teaching of mathematics

The methodological basis of the study is research on

- activity approach in teaching (PL. Galperin, V.V. Davydov, JI. V. Zankov, A.V. Zaporozhets, A.N. Leontiev, S. JI. Rubinshtein, N.F. Talyzina, JIM. Fridman, D.B. .Elkonin and others);
- the paradigm of student-centered learning (E.V. Bondarevskaya, A.A. Pligin, V.V. Serikov, I.S. Yakimanskaya, etc.);
- personality-oriented approach in teaching mathematics (V.A. Gusev, G.V. Dorofeev, A.G. Mordkovich, G.I. Sarantsev, etc.);
- systems of individualized and adaptive learning (A.S. Granitskaya, V.K. Dyachenko, V.I. Zagvyazinsky, N.P. Kapustin, G.K. Selevko, E.V. Smirnova, I. Unt, V.D. Shadrikov, V. F. Shatalov, N. V. Shilina, E. A. Yamburg and v others);
- competence approach in teaching (V.I. Baidenko, V.V. Bashev, V.A. Bolotov, A.A. Verbitsky, A.A. Getmanskaya, E.F. Zeer, I.A. Zimnyaya, D.A. Ivanov, T. M. Kovaleva, O. E. Lebedev, Yu. G. Tatur, I. D. Frumin, A. V. Khutorskoy, T. I. Shamova and others);
- the problem of the formation of mathematical competencies (M.L. Zueva, M.S. Kazanchyan, M.M. Minshin, V.G. Plakhova, S.A. Sevastyanova, G.V. Seraya, Ya.G. Stelmakh and others.).

To solve the tasks set, the following research methods were used: the study and analysis of psycho-pedagogical, educational, methodological and mathematical literature on the research topic; study and generalization of the work experience of secondary school teachers, university professors and their own experience of teaching mathematics in a technical university; putting forward and testing a working hypothesis about the possibility of using ACO when teaching mathematics to university students in order to form mathematical competencies; pedagogical experiment; statistical methods of processing the pedagogical experiment.

The scientific novelty of the research is that:

1. The possibility and expediency of basing the methodology for the formation of mathematical competencies among bachelors of a technical university on the scientific principles of an adaptive learning system is substantiated, since this contributes to the development of students' ability to independently set goals for their education, plan and analyze their activities, independently solve problems that make up the content of education;

2. On the basis of the adaptive learning system, the principles of the formation of mathematical competencies have been developed, including the principles of non-linear time distribution in the construction of a practical lesson in mathematics, heterogeneity in the work of students, self-regulation of educational activities, management of educational activities, modeling in solving educational mathematical problems and the competency-based selection principle adaptive mathematical tasks;

3. Criteria for determining the levels of mathematical competence of bachelors of a technical university (threshold, advanced, high) are identified, and criteria for selecting mathematical problems for individual work of students are formulated on their basis.

The theoretical significance of the study lies in the fact that: specific features of the adaptive learning system have been identified that objectively affect the formation of mathematical competencies (a significant increase in the time allotted for independent work of students, the use of multi-level tasks for independent work in teaching, providing students with the opportunity to work at an individual pace and choose the level of complexity of the tasks performed, manage the educational process through a network plan), and on their basis, the principles of the formation of mathematical competencies among bachelors of a technical university have been developed;

- defined approaches to teaching mathematics in a technical university, aimed at the formation of mathematical competencies, including the formation of the goals and content of such training; the levels of mathematical competencies (threshold, advanced, high) are specified, criteria for their determination are identified.

In this regard, the content of education at the university is important to improve in the direction of creating favorable conditions for the self-realization of students, the development of their creative abilities. This is reflected in the requirements of the State Educational Standard, which involve moving away from subject education and moving to a new, higher quality level of education, characterized by a systematic approach, integration of the content of education, use (mathematics and natural disciplines) of inter subject communications. In this aspect, various types of practices make it possible to adjust the content of training in the direction of its individualization.

Based on the analysis of psychological and pedagogical literature, the current Federal State Standards of Higher Professional Education, the experience of teachers who implemented ACO in secondary school, their own experience of teaching mathematics at a technical university, the following principles for the formation of mathematical competencies were identified:

- the principle of non-linear distribution of time in the construction of a practical lesson in mathematics;
- the principle of heterogeneity in the work of students;
- the principle of self-regulation of educational activities;
- competency-based principle of selection of adaptive mathematical tasks;
- the principle of educational activity management;

- the principle of modeling in solving educational mathematical problems.

Based on the formulated principles, a methodology has been developed for the formation of mathematical competencies of bachelors of a technical university. Under the methodology, we understand the totality of five hierarchically interconnected components: goals, content, methods, forms and means of education.

1) The purpose of the developed methodology is the formation of mathematical competencies in bachelors of a technical university. Mathematical competencies, which are part of the professional competencies of bachelor-engineers, are divided into 3 categories: conceptual (knowledge of basic definitions and theorems, the ability to apply this knowledge to solve problems); operational-algorithmic (knowledge of the basic algorithms, the ability to determine the range of tasks for which a specific algorithm is applicable, the ability to apply the required algorithm); applied (the ability to apply basic knowledge to solve problems of an applied nature, a vision of the applied aspect of the discipline).

2) The content of mathematical training is determined by curricula and provided by curricula of mathematical disciplines.

When selecting the content in accordance with the set goals, it was taken into account that the basic orientation of the course should be expressed in the explicit identification of fundamental mathematical concepts; in the active use of the method of mathematical modeling, which consists in compiling models and applying these models in practice. The applied orientation of the course should find its expression in increased attention to problems of an applied nature, to methods of approximate calculation.

The basis of the curriculum is a calendar plan, from which everything that each student must complete independently during each semester is highlighted in the matrix plan. These tasks, recorded using ciphers, as well as the time allotted for the individual work of the teacher with each student, are presented in a network plan - a graphical model of the educational process.

3) The most important means of forming mathematical competencies in the developed methodology are three-level adaptive tasks corresponding to the levels of mathematical competencies (threshold, advanced, high). In addition, three-level tasks are a tool for assessing the level of formation of students' mathematical competencies. Based on the analysis of the content of mathematical competencies, the criteria for determining their levels and the corresponding criteria for selecting adaptive tasks are identified.

4) The methodology for the formation of mathematical competencies does not require leaving the lecture-seminar system of education. Lectures are given in the traditional form and contain a large number of examples, illustrations, applied problems, basic schemes, and questions submitted for independent consideration. The most significant changes in comparison with the traditional system of education are undergoing the organization of a practical lesson, during which, at first, for 20-30 minutes, the teacher teaches all students at the same time, and the rest of the time, students work individually, in pairs and small groups. The teacher at this time works alternately with individual students, exercises control. With such an organization of training, operational self-accounting is introduced, which is based on the fact that one of the types of control over the results of independent work of students is mutual control and self-control.

The obtained experimental data showed that the content, means, methods and forms of training aimed at the formation of mathematical competencies in bachelors of a technical university gave positive results, therefore, the developed methodology can be considered effective.

This study aimed to develop a science-based methodology for the formation of mathematical competencies in bachelors of a technical university, based on the use of an adaptive learning system.

The research problem is relevant in connection with the transition of all universities of the country to training according to new educational standards and curricula and programs developed on their basis, in which the main learning outcome is presented in the form of a certain set of general cultural, professional and subject competencies.

During the ascertaining stage of the study, it was revealed that the traditional education system does not have sufficient capabilities to ensure the fulfillment of the requirements for mathematics. training of bachelors-engineers, reflected in the standards and curricula of the new generation. Thus, the need to create a methodology for the formation of mathematical competencies was determined. This required studying the essence of the concepts of "competence" and "competence", the list of mathematical competencies of bachelors, existing approaches to the formation of mathematical competencies.

The study of these issues made it possible not only to formulate the main provisions of the methodology being developed, but also set a further direction of research - an analysis of the experience gained by domestic pedagogical science and the search for a methodological system, the components of which can serve as a tool for the formation of mathematical competencies.

At the exploratory stage of the study, principles for the formation of mathematical competencies were developed. The methodology based on them includes the goals of training aimed at the formation of mathematical competencies among bachelors of a technical university, the corresponding content of mathematical education and methodological support of the educational process, the components of which are methods, means and forms of training.

During the formative stage of the study, a pedagogical experiment was conducted, the purpose of which was to introduce and test the methodology for the formation of mathematical competencies among bachelors of a technical university, based on an adaptive learning system. The obtained experimental data made it possible to conclude that there is a steady trend towards an increase in the level of formation of students' mathematical competencies, due to the use of the developed methodology in the process of teaching mathematics. Consequently, the assumption that the use of an adaptive learning system has a positive effect on the formation of mathematical competencies in bachelors of a technical university was confirmed.

When determining the levels of professionalism of activity, we consider the approach proposed by Chistyakov N.N. to be relevant (13). So, on the basis of the effectiveness of their activities, the teacher can be attributed to the following level:

- the first (minimum) - reproductive: the teacher transfers to others, then? what he himself knows; characterized by unproductiveness;
- the second (low) - adaptive: the teacher is able to adapt his knowledge and skills to the characteristics of the audience; unproductive;
- the third (middle) - locally modeling: the teacher has a variety of methods for teaching students to individual sections of the program, i.e. he is able to formulate a pedagogical goal, predict learning outcomes, and activate students' activities; medium productive;
- fourth (high) - system-modeling: the teacher owns the technology of teaching the subject as a whole; productive;

- the fifth (highest) - system-modeling creativity: the teacher owns strategies for turning his subject into a means of shaping the student's personality, the need for self-education, self-education, self-development; highly productive

In the development of professionalism in teaching, new approaches play a significant role, first of all, the introduction of continuous education, multi-level training of specialists.

Priorities for the development of mathematics education

Based on the above analysis, mathematics in the public education system. The main directions for the development of the teaching of natural sciences, have:

The requirements of the state educational standard in mathematics are, first of all, the future.

based on the needs of the modern state and society in the 21st century, the international quality of education and training in accordance with their skills to ensure compliance;

secondary specialized and vocational, higher education, next to institutions and scientific and methodological research structures, an integrated system that ensures cooperation, continuity and continuity formation;

new pedagogical technologies, a system for assessing the quality of work of teachers and trainees in the process of preparation at all stages.

The requirements of the state educational standard in mathematics are, first of all, the future.

Based on the needs of the modern state and society in the 21st century, the international quality of education and training in accordance with their skills to ensure compliance;

In secondary specialized, vocational educational institutions, improving the quality of mathematical education in the regions; organizing and developing a system of specialized schools;

mathematics personnel, especially in rural areas, the system of training and retraining of school personnel development;

textbooks and math manuals improvement;

identification of talented young people and their mathematical skills; successful participation in local and international scientific competitions and receiving prizes;

qualitative updating of the content of mathematical science, as well as

improvement of teaching methods, educational process gradual implementation of the principles of individualization;

improvement, optimization and content of mathematical science; strengthening of integration with other general educational disciplines;

knowledge and skills acquired by students in real life situations; application, mathematical literacy, critical, creative and creative formation of competencies;

efficiency and effectiveness of the educational process in mathematics modern digital technologies and innovations in providing the implementation of approaches;

the best international practice in assessing student achievement and this is a new assessment system based on the results of international research in this field to create and assess the level of knowledge in mathematics based on it

introduction of a national certification system to raise the quality of mathematics teaching to a new level,

including modern information and communication technologies, used an electronic textbook and modern laboratory equipment

new scientific directions in the organization of the educational process and the implementation of the principles;

combine education and upbringing so that students receive not only education, but also form as a spiritually mature person;

creation of a healthy creative environment in the lessons of mathematics, teaching and education through the introduction of advanced innovative modern technologies in the process, raising the quality of education to a new level, changing the worldview of students, developing thinking, logical independent thinking skills;

extra-curricular and out-of-school teaching of mathematics radical renewal of the content of circles, electives and electives;

development of scientific and methodological support for teaching mathematics;

young people who have won international scientific olympiads and their coaches improving the system of teachers' motivation;

Thus, the introduction of digital technologies and modern methods in the educational process, the formation of an innovative infrastructure through the knowledge and skills acquired by students in the field of mathematics and lessons to show that their skills are relevant to everyday life and conducting research in extracurricular activities, design creativity, develop innovation interest in creativity.

The level of professional competence of teachers in mathematical training is largely determined by their ability to develop their creative potential and productively engage in self-improvement. The connection between a person's ability to self-development and the characteristics of his professional activity, the specific results of his activity allows us to consider professional self-improvement as an important area of training specialists, an indispensable element of professional activity.

Professional self-improvement is understood as a type of activity that involves the conscious formation, development and improvement of professional knowledge, skills, abilities and psychological properties of the individual, i.e. proper professional competence.

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