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Development of professional competence of future mathematics teachers in the HEI educational process

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Abstract

Relevance. The importance of this study is due to the evolution of modern education towards excellence and the need to constantly monitor the relationship between teacher's self-education, knowledge culture, professional training and social requirements. For that reason, it is important to use modern approaches and methods to prepare a mathematics teacher.

Purpose. The purpose of the study is to describe and diagnose the methodological and technical features of teacher training, to determine the level of competence of mathematics teachers in their work, their ability to use self-education techniques and the main methods of theoretical and methodological preparation for students' educational activities.

Methodology. Typical methods used in research on this topic – analysis, classification, reasoning, synthesis and comparison of approaches – make it possible to identify and highlight key areas for improving the professional training of future teacher.

Results. The study examines methods for developing students' competence, analyses the literature, determines the components of mathematics teacher competence, highlights the functions and levels of development, provides the structure of the highest levels of teacher professional competence, determines the content of professional competence of a future mathematics teacher, presents models for the development of methodological knowledge about the professional competence of students and improving educational culture, diagnoses problems, related to the professional competence of students.

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Conclusions. Professional development is an ongoing, cyclical process because professionalism requires continuous enhancement. The advancement of this process largely depends on an environment that encourages self-development. A key objective in the professional training of mathematics teachers is to cultivate professional competence. This competence reflects students' readiness to apply both theoretical and practical knowledge in science and education, as well as their ability to enhance and refine their qualifications. The study indicates that the professional competence of a future teacher encompasses several aspects: motivational, cognitive, operational, creative, and reflective.

Keywords: mathematics teacher; educational process; quality of methodological training; methodological knowledge; methodological culture; professional competencies.

Introduction

The modern world creates a serious challenge to the intellectual capabilities of a person who must perceive information, generate new ideas and ways of activity. For many years, the pedagogical community has been discussing the issue of high-quality training of mathematics teachers and technologies for evaluating their professional competencies and methodological culture. The identification of professional knowledge of teachers based on experience, the self-assessment of qualified teachers and the diagnosis of their professional knowledge and skills are important elements in the development of professional training of future teachers of mathematics [1].

Part of the professional knowledge and skills that teachers acquire during their professional practice in schools should be provided by higher education institutions. It is assumed that the content of the professional competencies of mathematics teachers will be closely related to the content of their curricula and training.

One of the key priorities for improving the quality of education is the introduction of a system of continuous professional development, the mechanism of which is the development of individual learning paths [2]. Moreover, it is becoming increasingly important to consider methodological competence as one of the components of professional competence and to analyse the positive impact of partnerships between the university and the school on the development of professional training of students [3].

Researchers single out methodology, psychology, pedagogy, technological culture and teacher competence as professional qualities that contribute to innovation in the educational process. The readiness of teachers to integrate modern technologies into the process of teaching and learning and to use digital resources in their professional activities is an important aspect of changes in the improvement of education.

The technological culture of a modern mathematics teacher will contribute to the optimisation of education and create a comfortable psychological atmosphere. Modern teachers need to look at their subjects and teaching methods from a broader perspective and benefit from the experience of other teachers and researchers. Teachers should also have a positive impact on the personal, private and professional development of students [4].

In addition, special teacher training is a factor in the successful learning process and the use of project activities, which requires the use of specific psychological mechanisms and teaching methods [5].

The purpose of this study is to describe and analyse the professional development of future teachers of mathematics in the higher education system. Special attention is paid to the study of the cognitive characteristics of future teachers, subject-specific teaching methods and

teaching methods that take into account a student-centred approach. It is noted that to achieve learning outcomes, it is important to maximise the attention and activity of students during their studies.

It describes the structure of mathematics teacher competencies, defines the functions and levels of their development, presents a reference model of competency components, presents an interpretation of the professional competencies of future mathematics teachers, builds a model of professional development of a mathematics teacher on the basis of a formed culture of professional training of a mathematics teacher, and presents the levels of professional training and methodological development.

The professional competence of teachers plays an important role in the context of ongoing radical changes in the education system of Kazakhstan (modernization of the education system, formation of new values, change in the generally accepted educational paradigm and entry into the global unified educational space).

The professional training of teachers will ensure an effective educational process that will meet the modern requirements of society. Successful professional activity requires lifelong training and development of professional competencies, where self-improvement and self-education are crucial factors of professional growth. For that reason, it is worth noting the importance of lifelong education (in the adult period in the form of postgraduate education), which is becoming one of the leading areas of development of the modern educational space.

Materials and Methods

In this study, the following methods were used:

1) theoretical (analysis of philosophical, pedagogical, psychological and methodological literature on the topic under study; analysis of the specific content of advanced training; generalization of theoretical material related to the problem under study);

2) deduction and induction to compare and highlight key areas for improving the professional development of future teachers, classification, theoretical modelling to build models of professional development of future teachers;

3) comparison of approaches to the theoretical understanding of teacher competence and consideration of this issue from the point of view of higher education;

4) comparison and systematization of studies on a given topic; description and oral fixation of materials and the results of the study);

5) diagnostics (educational and professional activities of students, tests, interviews with student

teachers, research showing the level of their professional development);

6) empirical (study of the results of professional training of future teachers of mathematics, pedagogical observations in the educational process);

7) experimental (natural experiments), graphical presentation of the results (histograms or diagrams).

Shoquan Ualikhanov Institute (Faculty of Physics and Mathematics) and the Akmola branch of the National Centre for the Development of Educational Competences have become experimental research centres.

At the first stage, the existing pedagogical approaches, programs and training systems for the professional development of mathematics teachers were theoretically considered and analysed in order to identify their principles and features; detailed and comprehensive information about the subject and its features, studies on explanatory approaches, books, studies, monographs, conferences and articles that shed light on certain aspects of professional culture and skills development.

It shows the structure and functions of this phenomenon, analyses and illustrates the results of studies related to the education and training of future teachers, and describes the level of professional development of future teachers of mathematics; emphasizes the importance of methodological skills, knowledge and competence in the practical application of psychological and pedagogical knowledge, introduces the results of other studies, determines the problems, goals, formats and methods of research, plans to conduct experimental studies.

At the second stage, experimental studies were carried out to observe students studying physical mathematics in their natural learning environment and to substantiate the goals of teaching undergraduate mathematics students, taking into account the importance of methodological and professional training of students; the standards, indicators and levels of professional development in pedagogical practice were analysed, the standards of professional competence for mathematics teachers were determined.

Also a spatial model of students' professional competence was identified; assessment of the professional competence of teachers in regular higher education includes the results of the test "Professional competence of teachers", which reveals the degree of development of students' practical skills, knowledge, reflection, creative and critical thinking; methods and techniques for successful professional development and training of future teachers have been developed, and the results of empirical research have been systematized.

The third stage includes the systematization and categorization of the material obtained in the course of monitoring the development of professional competencies and skills of future secondary school mathematics teachers.

The theoretical and practical results and results of research were examined; a comparative analysis of research and research approaches on this topic was made; generalization and logical conclusions of researchers' experiments, field experiments and interview samples on the characteristics and development of teachers' competencies, as well as professional development methods that guarantee high-quality training of future teachers of mathematics were studied.

Results

Theoretical foundations of creating tools and methods for evaluating the quality of the organisation of education

To prepare future teachers of mathematics means to ensure a high level of personal and professional competence, since modern requirements for professional competence are quite high. Teachers are obliged to constantly expand their system of knowledge, skills, and abilities, obtaining a higher level of qualification.

Professional competence is a set of personality traits that creates and ensures effective professional activity. Currently, a teacher who will influence the development of student values, create learning based on creative processes is in demand. Furthermore, the future teacher should strive for self-development and professional self-education, which is disclosed in the integrated term "competence" [4].

The methodological competence of a mathematics teacher is part of a professional one and includes knowledge of teaching methods, didactic forms, psychological mechanisms, and the ability to apply them in practice. The main tasks of the future teacher can be divided into 3 main types: mathematical, educational, and professional [6].

They are the basis of professional competence. The essence of educational and mathematical problems consists in the ability to solve specialised tasks, to identify mistakes of schoolchildren in solving mathematical problems and their causes, to help in finding suitable solutions, to develop critical thinking. Professional tasks allow for creating favourable learning conditions, regulating conflict situations, and increasing the social potential of students.

It is important to highlight the purposes of future teachers' mathematical training, which accurately describe the requirements for the quality of mathematical training in the format of a competence approach. Y.B. Sikora [7] and L.V. Shkerina [8] identify the following purposes of mathematical training of a bachelor of pedagogical department:

1) acquisition of fundamental specialised knowledge of the future teacher (theoretical and methodological basis of the subject) and readiness for scientific substantiation of the course, its structure, methods, etc.;

2) development of perception of mathematics as a universal means of modelling phenomena and processes, cognition of its concepts and approaches; readiness to develop these qualities in students;

3) development of logical and critical thinking, imagination, algorithmic culture and the ability to advance these qualities in schoolchildren;

4) acquisition of practical knowledge of students based on solving problems of applied, practical, and social orientation;

5) prepare future teachers to understand the importance of this subject for technological progress and equip them with the skills to transfer this knowledge to their students;

6) the development of research mathematical activity, innovation, creativity of the future teacher.

Based on a review of existing research, the criteria for the professional effectiveness of mathematics teachers

were defined as motivation (awareness of the importance of future professional activity, interest in the profession and motivation to develop professional competencies) and cognition (knowledge and awareness of the importance of problems and competencies that underlie successful future professional activity); operational (a set of professional skills and competencies (projective, organizational and communicative)), creative and personal (creative qualities of a person), reflective (understanding one's importance in a team, awareness of one's activities, reflection, recognition and self-realization in professional activities).

A model of a student's mathematical competence

The competence characteristic of students is that they possess professional and personal qualities. The value aspects make it possible to determine the motives, attitudes, state, and readiness of the student for future professional activity. Based on this, it is possible to distinguish the structure of professional competencies, which consists of four components: "knowledge" (K), "skills" (S), "experience" (E), and "values" (V) (Figure 1) [8-12].

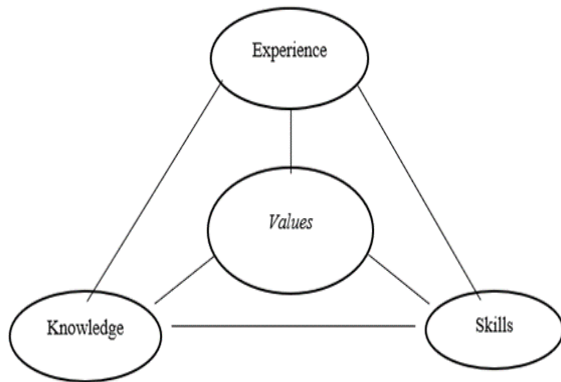


Figure 1. Spatial model of students' professional competencies

Based on the basic requirements for the development of students' competencies at a particular stage of training, a number of criteria and their features can be identified to the level of their cognitive, praxiological, and axiological components of professional competence (Table 1).

Table 1. Criteria model of competence components development

Competence component	Criteria of development
Cognitive	<ul style="list-style-type: none"> - knowledge of the structure of the curriculum; requirements of the education system; - availability of theoretical and practical knowledge about the subject and its specific features; - the ability to determine the target component, content, and methods of teaching that are aimed at achieving subject, meta-subject, and personal results; - to recognize the psychological and pedagogical conditions for the inclusion of disciplines in the curriculum, as well

	as the knowledge and methodological conditions for their implementation.
Praxeological	<ul style="list-style-type: none"> - ability to develop a programme of an academic discipline or course; - develop skills, competencies and activities in areas of competence; - the ability to build scenarios of training sessions, considering the characteristics of schoolchildren.
Axiological	<ul style="list-style-type: none"> - understanding of the role of the discipline programme in the creation of the educational process; - showing interest, initiative, and organisation; - focus on obtaining results; - awareness of the importance of using the programme.

Note: this table presents the main components of the professional competencies of future teachers of mathematics and the criteria for their development.

Source: [8].

The created model is quite relevant and has great practical value. To enable future mathematics teachers to evaluate and measure their own level of development [13-16].

Research stages and results

This experiment consists of the following steps:

- review of the literature and research on the professional development of future teachers; substantiation of conceptual ideas and methodological foundations of the teacher's professional development, formulation of its essence and structure;
- diagnostics of professional development, graphical presentation of the results of the study;
- formulation of techniques and methods of professional development of future teachers of mathematics.

In this study, the level of professional development of future mathematics teachers was identified and compared. The "Professional competence of teachers" test was applied [9].

The experiment is also based on observations of student teachers in situations of learning and practice. The purpose of the study, in particular, was to determine the degree of development of practical skills, knowledge, reflection and creative and critical thinking skills in students.

The study involved 133 science students (mathematics and physics) and 82 direct non-experimental participants, which helped to identify sustainable, holistic and systematic knowledge acquisition processes in the field of psychology, pedagogy, mathematics and teaching, as well as to determine their competencies in productive professional activities.

An analysis of the results of the diagnostic questionnaires led to the conclusion that 25% of the respondents have high professional competence, are able to teach in accordance with the goals of the main educational program and use innovative teaching methods.

Furthermore, this group could ensure maximum individualisation of students' activities, use various information and communication technologies for the learning process. In addition, these students demonstrated a willingness to apply various forms of individualisation in the organisation of individual and group learning activities.

This level can be called creative, since it is characterized by a constant interest in learning, the ability to solve non-standard problems and make informed decisions, self-expression, self-development, objective self-assessment and possession of methods of self-assessment and self-improvement [17].

The average level of professional development (47%) is characterized by the ability to plan lessons in various ways, taking into account the requirements of teaching standards. The participant groups organized their lessons using effective teaching methods and were able to diagnose the learning outcomes achieved based on student analysis.

In this category, it is not necessary to distinguish between two levels of professional development: algorithmic and semi-exploratory. Students showed

occasional interest in the teaching profession, had insufficient skills to use existing knowledge to develop professional competence, and had an unstable need for self-improvement.

Many of the participants showed awareness of their actions and aspirations for decision-making. They wanted to introduce something new, were motivated to teach, understood the importance of mathematics as a subject, but these students had insufficient clarity in determining the purposes of professional competence development [18-20].

28% have a low level of professional development. They could not plan the training sessions in accordance with the basic requirements; correlate the didactic material with the principles of the teaching methodology of the subject. They often reasoned their choice of teaching methods and used certain types of information and communication technologies during classes. They could also conduct an objective evaluation of educational results.

This group belongs to the adaptive level, which shows underdevelopment of professional intentions, lack of necessary knowledge and skills to solve pedagogical situations and tasks, partially inadequate self-esteem [21; 22] (Figure 2).



An analysis of the results of a study of the competencies of future teachers of mathematics shows that the use of technology, a wide range of teaching methods and practical exercises is not necessary to support the personal development and self-education of students. It should also be noted that the existing teacher training system does not pay enough attention to the development of a professional culture of teacher competence, which determines the need for the use of experimental technologies in the educational process.

Professional competence in universities is developed at motivational, content-theoretical, procedural-activity, analytical-corrective stages. At the motivational-orientation stage, the development and understanding of the purposes, motives, and values of pedagogical activity

take place. During this period, the assimilation of blocks of disciplines of natural science, professional and practical training take place, where diagnostics and testing of professional potential play a key role. The main methods are business games, attendance and analysis of lessons. To develop a positive perception of the pedagogical activity, to increase the level of professional competence, it is possible to use educational and pedagogical situations of self-cognition, conduct problematic discussion classes, training, games [23-25].

The purpose of the content-theoretical stage is the development of professional, psychological, pedagogical, and methodological knowledge of the student. The main methods are lectures-presentations and mini-lectures,

which will allow the student to creatively reproduce educational information.

The procedural-activity stage is a logical continuation of the first. The main goal and priority are the development of the content and activity components of professional qualifications, i.e., in-depth study of the psychological and pedagogical disciplines of the methodology of teaching mathematics. For this stage, it will be appropriate to use training, educational and pedagogical tasks, integrated tasks.

The stage of corrective analysis is the basis for the development of the reflective and research component of the teacher's professional competence.

For this purpose, the analysis of the student's portfolio is conducted along with the discussion of various problems in pedagogical activity and design of ways to solve them, introspection of design, organisational, communicative skills, reflection training. The results of independent work and teaching fragments of lessons can be shown by future mathematics teachers in practical classes [7].

Discussion

The discussion of the problems of training mathematics teachers in pedagogical HEIs is constantly in the zone of increased attention of researchers dealing with problems of mathematical education. Currently, it is important not only to teach well but also to develop the mathematical abilities of schoolchildren. The development of mathematical competence is one of the main tasks of teachers in schools. To promote development, highly qualified teachers must be able to effectively use their knowledge, life experience, personal and professional values.

A.M. Muratalieva [18] argues that the solution to the problem of reforming the education system depends on the comprehensive introduction of a competency-based approach to the content of vocational education and advanced training of mathematics teachers. The main goal of preparing a future teacher in higher education can be achieved through the systemic implementation of the content of education. Emphasis is placed on the basic preparation of university content, the study of key topics, the acquisition of long-term knowledge of fundamental scientific methodologies and the adaptation of future mathematics teachers to the rapidly changing requirements of society and the labour market [26; 27]. In this way, students develop skills and competencies, adapt to systems analysis, design and modelling, and prepare for self-education and professional development.

The main principles are based on a set of specialized studies that are part of preparing a student for professional activity. The application of a competency-based approach to the content of education is associated with the transition to a multi-level structure of higher education. The inclusion of this approach in the development of professional competencies allows students to quickly process various information, abstract from the conditions of the task and prepare for life situations.

With the introduction of the competence-based approach, the study of independent research activities of future teachers of mathematics is of great importance. It should be understood that competence is a general ability and a system of knowledge that is created during activity and allows a person to establish a practical relationship

between the situation and theoretical knowledge, to determine a system of actions to solve a problem [28]. It has been proved that during the educational process the professional competence is developed by means of the content of the studied subject [10].

Moreover, modern achievements in science, technology, chemistry, biology, economics and other fields would not be possible without the use of mathematical knowledge. The main goal of the professional training of future teachers of mathematics is the formation of professional competence, including the desire and ability to use theoretical and practical knowledge in scientific disciplines and educational programs.

T.L. Blinova and I.E. Podchinenov [17] conducted an analysis of the training of teachers of mathematics, taking into account the cognitive characteristics of students, object network technology and student-centred learning goals. The results showed that in order to achieve learning outcomes, one should strive to create an environment in which students are focused, highly involved and interested in the learning process.

L.I. Tokareva [21] considered two groups of fundamental competencies: subject-methodical; ideological and methodological, which become the basis and a certain system of teacher skills. The ability to develop a mathematical language was studied in detail.

Most of the research on the relationship between math teacher qualifications and performance is limited to specific dimensions of performance. Moreover, most of these studies use a variability-based approach based on the homogeneity of teacher performance. In many studies, teacher effectiveness is viewed as a complex and multidimensional construct, including thematic and general aspects of the knowledge and skills of mathematics teachers [29-31]. All this can be evaluated using standardised methods of well-proven tools.

Based on a personality-oriented approach, a group of mathematics teachers at the courses of the Institute for Advanced Training of the Akmola region was studied. The data covered four profiles of the teacher's competencies, which differed quantitatively and qualitatively. It was diagnosed that the need for high levels of knowledge and skills is increasing, and the importance of educational beliefs related to the dynamics of mathematics requires more attention. Furthermore, the results indicate the need for a stronger thematic operationalisation of the quality of education [11].

In general, the problem of professional training of future teachers of mathematics for independent, creative and practical activities has always been at the centre of attention of the scientific and educational system. Pedagogical education in the Republic of Kazakhstan is analysed with a focus on the structural aspects of the reform of vocational education.

The research method was the analysis of legal documents, scientific literature, in particular, studies on psychology and pedagogy. It presents the main aspects of pedagogy based on professional development, including the systemic nature of teacher education, the priority of the theory of the subject in professional activity, the integration of theory and practice, the gradual acquisition of theoretical knowledge, learning to transfer theory into practice, learning to solve standard and non-standard

professional problems, pedagogical diagnostics and examination of the educational process and the results of educational work [12; 32].

T.B. Rudenko [19] studied teachers' perceptions of the degree to which they acquired pedagogical and methodological skills and competencies. The author concluded that 60 % of teachers who had worked for three years demonstrated those competencies to the extent of their experience. The group that worked for less than three years had less developed professional competence (24% of teachers).

However, this study is a question-and-answer approach and does not consider the realities and dynamics of teacher development. N.N. Vasyagina and Y.V. Bratchikova [23] tend to view learners as people who play an important role in the learning process. One of the purposes is to create a teaching experience. The authors believe that the effectiveness of the development of basic skills, competencies and competencies depends on well-organized interaction between students and teachers.

In determining the professional characteristics of competencies, research is important to clarify the nature of the concept of "competence" [13]. The content of the activity structure of future mathematics teachers consists of components (psychological, didactic, methodological, pedagogical and communicative) that directly affect the pedagogical knowledge, experience and skills of a specialist.

The theory and practice of pedagogical education includes professional adaptation, advanced training, qualifications and pedagogical skills. The professional competence of students should be developed in several stages, including a pedagogical course (initial psychological and pedagogical training of students), methods of teaching subjects (study of materials and teaching aids, involvement in educational work), and pedagogical practice at school (teachers acquire skills of independent research, identify their work and effective diagnostic methods; preparation of students for pedagogical activity and evaluation of the development of skills) [33-36].

To achieve effective results in the professional development of future teachers, the following recommendations should be emphasized:

1. It is worth promoting the development of electronic complexes.

2. It is important to create integrated programmes and textbooks of pedagogical and special methodological disciplines in an educational institution.

3. For future mathematics teachers to advance in a competitive environment, their skills and competencies must be self-developed and supported by professional development.

4. It is advisable to promote the experience gained by teachers who have achieved high results in their creative and professional activities.

At the present stage of the development of higher education, the professional training of future teachers of mathematics is more important than ever. A number of researchers analysed the problem of professional training of future teachers and considered the qualities that graduates should have. Research in this area is aimed at identifying and substantiating the structural components of

the professional competencies of mathematics teachers [14].

The main method used to study this issue is a comparative modelling method that takes into account various research approaches to the competence construct and presents this model as a system of interrelated components. In this study, it is important to understand the nature and content of the structural elements of teachers' professional competencies: professional and personal element, motivational element and activity element.

As a result of the study, it was diagnosed that professional competence is a level model of interrelated elements, where the basis consists of professional and personal aspects. Therefore, the training of future teachers is one of the priority areas in education.

There is an interesting study investigating the impact of the academic supervision process on the professional development of supervisors [15]. This activity, admittedly, is an attempt by the authorities to advance the teacher's qualifications. The competencies of teachers include planning (creation of educational tools and mass media), implementation (assimilation of material, teaching methods, assessment), and improvement of teachers' ability to conduct active, creative, and effective learning [37; 38].

The results of the study are consistent with the opinion that the competence of a teacher is their knowledge, skills that a teacher should have and apply in accordance with the needs of the field. This means a positive and significant impact on teacher performance.

The results obtained show that there is a direct influence of the leadership (7.1%) and the competence of the teacher (88.7%) on the effectiveness. The knowledge and skills of the teacher become dominant in comparison with the leadership. This means that the effectiveness of a teacher is higher if their competence is well developed [39].

Evaluation studies were also analysed to identify weaknesses in the work of mathematics teachers [6]. In addition, by focusing on professional competence and identifying its consequences, individualized professional development courses can be developed. The results showed that mathematics teachers with high professional competence and many years of experience were able to conduct video lessons, pass tests on basic knowledge and receive higher scores.

More importantly, not all teachers are able to explain how to successfully manage students to avoid mistakes when solving mathematical problems. Such research could include activities that help students to develop a deeper understanding of mathematical concepts, rather than memorizing formulae [16].

The results confirm that the presented systematic assessment is consistent with the objectives of the study. The levels of professional competence of mathematics teachers were assessed using diagnostic tests and video lessons. Some mathematics teachers could not use teaching methods correctly and failed to solve mathematical problems.

Failure to solve some problems is associated with attempts to solve them formally, without using experience and determining similar answers using the Internet or imitating the answers of other teachers, which is one of the

reasons for the inability of mathematics teachers to demonstrate their professional competence [40; 41].

On the other hand, specialized tasks turned out to be the most difficult to solve, since most teachers did not take into account real professional conditions. The total scores of the diagnostic test and video lessons were assigned to different levels of professional competence: 24% of the participants reached level I, 44% - level II, 9% - level III and 23% did not reach the level of professional competence. These results point to the need to develop special professional development programs for teachers.

Professional development is being obtained by solving mathematical, pedagogical or professional problems in professional courses. The results show that professionalism in the professional qualification framework is in fact a need for teacher training. In other words, the proposed scheme can be included in the educational process to improve the performance of future mathematics teachers.

The results of the analysis of problems in this study lead to a broad consensus on the need to improve the professional performance of future mathematics teachers in the higher education system.

Conclusions

Professional development is a cyclical process, since professionalism must be constantly developed. The prospects of this phenomenon depend on the environment that should stimulate self-development. One of the main goals of the professional training of teachers of mathematics is to develop professional competence, reflecting the readiness of students to apply theoretical and practical knowledge in the field of science and education, to improve and improve their qualifications. Based on the study, it can be said that the professional competence of a future teacher consists of motivational, cognitive, operational, creative and reflective aspects.

This study indicates that the studies of these authors have significantly improved the understanding of the essence and content of professional competence, the importance of its development. Therewith, today the issue of the establishment of this phenomenon is becoming very

relevant in accordance with the development of society at the present stage.

The educational system is constantly being improved and is moving to an innovative type due to the implementation of the adopted regulatory documents in the field of education. Changes in the structure and content of pedagogical training in higher education institutions that affect the educational paradigm are of great importance.

Research can be useful for future mathematics teachers, students who are just gaining knowledge and acquiring practical skills. Moreover, the theoretical data of this study will be relevant for graduate students, applicants and teachers of pedagogical universities seeking to optimize the formation and development of professional competence.

In the course of the study, new questions and problems have arisen that need to be addressed. It is worth continuing the research and deepening it, proceeding with the study of the professional training of mathematics teachers, covering aspects and methods of its development, teaching future teachers forms of professional self-development and self-improvement. Promising areas of pedagogical work are associated with the study of the key features of preparing students to work with research, experiments, and the specificity of mastering practical knowledge and skills.

The conducted research does not include a comprehensive solution to the problem of training competent teachers; therefore, further scientific research is expected in the following areas: improving the content, methods, techniques and technologies for training future teachers of mathematics, involving teachers and researchers in the development of educational and methodological support based on a competency-based approach.

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Conflict of Interest

None.

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Розвиток професійної компетентності майбутніх вчителів математики у процесі вищої освіти

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Анотація

Актуальність. Важливість цього дослідження обумовлена еволюцією сучасної освіти до високого рівня і необхідністю постійного контролю за взаємозв'язком між самоосвітою вчителя, культурою знань, професійною підготовкою та соціальними вимогами. Тому важливо використовувати сучасні підходи та методи підготовки вчителя математики.

Мета. Метою дослідження є опис та діагностика методологічних та технічних особливостей підготовки вчителя, визначення рівня компетентності вчителів математики у їх роботі, їх здатності використовувати техніки самоосвіти та основні методи теоретичної та методологічної підготовки до навчальної діяльності студентів.

Методологія. Типові методи, що використовуються в дослідженнях з цієї теми - аналіз, класифікація, міркування, синтез та порівняння підходів, дозволяють виявити та виділити ключові напрямки удосконалення професійної підготовки майбутнього вчителя.

Результати. У дослідженні розглядаються методи розвитку компетентності студентів, аналізується література, визначаються складові компетентності вчителя математики, виділяються функції та рівні розвитку, надається структура найвищих рівнів професійної компетентності вчителя, визначається зміст професійної компетентності майбутнього вчителя математики, презентуються моделі розвитку методологічних знань щодо професійної компетентності студентів та удосконалення освітньої культури, діагностуються проблеми, пов'язані з професійною компетентністю студентів.

Висновки. Професійний розвиток - це постійний, циклічний процес, оскільки професіоналізм потребує постійного вдосконалення. Покращення цього процесу в значній мірі залежить від середовища, що сприяє самовдосконаленню. Однією з ключових цілей у професійній підготовці вчителів математики є культивування професійної компетентності. Ця компетентність відображає готовність студентів застосовувати як теоретичні, так і практичні знання у науці та освіті, а також їхню здатність покращувати та удосконалювати свої кваліфікації. Дослідження показує, що професійна компетентність майбутнього вчителя охоплює кілька аспектів: мотиваційний, когнітивний, операційний, творчий та рефлексивний.

Ключові слова: вчитель математики; освітній процес; якість методологічної підготовки; методологічні знання; методологічна культура; професійні компетентності.