IRSTI 27.01.45

A.A. Toktorbekova[1]
[1]Suleyman Demirel University, Kaskelen, Kazakhstan

DIRECTIONS FOR IMPROVING THE METHODOLOGICAL TRAINING OF FUTURE MATHEMATICS TEACHERS FOR THE ORGANIZATION OF PROJECT ACTIVITIES OF STUDENTS

Abstract. This article describes the goals of the methodological training of future mathematics teachers at a pedagogical university (scientific and methodological knowledge, scientific and methodological and organizational and methodological skills), the structural components of their methodological training (methodological special courses, final qualification and coursework, pedagogical and educational practice). Determination of the essential characteristics of the readiness of mathematics teachers to organize the project activities of students made it possible to outline the ways of developing the necessary professional qualities in order to prepare the future specialist for a rational, creative solution of didactic problems of teaching mathematics using the project method. On the basis of this, in this article, the directions of improving the methodological training of future mathematics teachers for the organization of project activities of students are determined and substantiated.

Keywords: method of projects, methodological training, didactic tasks, design and research activities, educational and methodical task, general methodological skills.

***

Аңдатпа. Бұл мақалада болашақ ЖОО-дағы математика мұғалімдерін әдістемелік даярлаудың мақсаттары (ғылыми-әдістемелік білім, ғылыми-әдістемелік және ұйымдастырушылық-әдістемелік шеберлік), олардың әдістемелік даярлығының құрылымдық компоненттері (әдістемелік арнайы курстар, қорытынды біліктілік және курстық жұмыс, педагогикалық және білім беру практикасы). Математика мұғалімдерінің оқушылардың жобалық іс-әрекетін ұйымдастыруға дайындығының маңызды сипаттамаларын анықтау болашақ маманның математиканы жоба әдісін қолдану арқылы оқытудың дидактикалық мәселелерін рационалды, шығармашылық шешуге дайындау үшін қажетті кәсіби қасиеттерді дамыту жолдарын анықтауға мүмкіндік берді. Осының негізінде осы мақалада болашақ математика мұғалімдерінің оқушылардың жобалық іс-әрекетін ұйымдастыруға әдістемелік дайындығын жетілдіру бағыттары айқындалды.

Түйін сөздер: жобалар әдісі, әдістемелік дайындық, дидактикалық міндеттер, жобалау-зерттеу қызметі, оқу-әдістемелік міндет, жалпы әдістемелік шеберлік.

***

Аннотация. В данном статье охарактеризованы цели методической подготовки будущих учителей математики в педагогическом вузе (научно-методические знания, научно-методические и организационно-методические умения), структурные компоненты их методической подготовки (методические спецкурсы, выпускные квалификационные и курсовые работы, педагогическая и учебная практики). Определение сущностных характеристик готовности учителей математики к организации проектной деятельности учащихся позволило наметить пути развития необходимых профессиональных качеств с целью подготовки будущего специалиста к рациональному, творческому решению дидактических задач обучения математике с использованием метода проектов. На основании этого в данном статье определяются и обосновываются направления совершенствования методической подготовки будущих учителей математики к организации проектной деятельности учащихся.

Ключевые слова: метод проектов, методическая подготовка, дидактические задачи, проектно-исследователъская деятельность, учебно-методическая задача, обще-методические умения.

Introduction

One of the topical directions for improving the quality of training of future teachers is to ensure the innovative nature of vocational education, the implementation of a competency-based approach, the relationship between academic knowledge and practical skills. To provide a connection between the theoretical training of a student of a pedagogical university with his future professional activity, it is possible to introduce new modern teaching technologies into the educational process, among which project-based teaching technologies are currently particularly prominent.

The organization of project activities of students - future teachers is actively discussed by domestic and foreign researchers, which is due to the modernization of the higher education system on the basis of system-activity and competence-based approaches. To date, the theory of the technology of project-based education for primary and general education has been developed quite deeply, a large practical experience has been accumulated in its use in the educational process and extracurricular activities. However, for the system of higher education and, in particular, for the training of future teachers, theoretical and practical development of the use of project activities is still not enough [6]. Graduates of pedagogical universities, future teachers of mathematics, do not have a sufficient level of effective use of project-based teaching technology, which, in our opinion, is explained by the insufficient development of a

methodology for its use in the process of methodological training of students. The designated problem indicates the need to improve the methodological training of future mathematics teachers for the organization of project activities of students.

In this regard, the article set the goal of the article: to determine and substantiate the directions for improving the methodological training of future mathematics teachers for the organization of project activities of students.

The goals of the methodological preparation

The goals of the methodological preparation of the future teacher of mathematics are to form the following knowledge and skills:

Scientific and methodological knowledge:

- goals and objectives of teaching mathematics at the present stage of development of secondary education;
- theoretical foundations of teaching methods of mathematics as a pedagogical science and methods of its research;
- ways of implementing the connection between theory and practice in the process of teaching mathematics;
- principles for selecting the content of a school mathematics course, to understand the relationship of this course with other school disciplines;
- the content of the school mathematics course at various levels learning, different teaching options and different conditions technical and software-methodological support;
- the main software package designed for teaching mathematics at different levels of education.

Scientific and methodological skills:

- systematically work with scientific, methodological literature with the aim of self-improvement in the professional plane;

Organizational and methodological skills (skills):

- to organize the educational process in mathematics; correctly build a lesson (correspondence between the main task of the lesson and the selected forms of organizing the work of students); ability to plan your work;
- to present new material with the practical application of methods and forms of organizing problem-based learning;
- plan and carry out the consolidation and repetition of the studied material;
- organize work in the computer room;
- use various forms of extracurricular work with schoolchildren in the field of informatics and its applications;
- evaluate the results of teaching mathematics and adjust the learning process depending on them;

Structural components of the methodological training

Structural components of the methodological training of future mathematics teachers: pedagogical and educational practice, special courses in teaching methods, term papers and final qualification works.

The most significant component of the professional and, consequently, methodological training of future teachers of mathematics is the practice of students (educational practice, pedagogical practice). The main goal of the educational practice is to consolidate the knowledge, skills and abilities of organizing educational work in mathematics, to develop methodological techniques for organizing the educational activities of students.

The tasks of pedagogical practice include the application of theoretical knowledge gained in the process of studying courses in pedagogy, psychology and methods of teaching mathematics in practical activities, the acquisition, study and analysis of pedagogical experience.

The main goals and objectives of pedagogical practice in the framework of methodological training are:

- study of the main activities of the teacher of mathematics;
- mastering the forms and methods of organizing and carrying out extracurricular work in mathematics;
- inclusion of a student in the educational process as a subject teacher, as a teacher-educator;
- teaching specific topics of basic and specialized courses in mathematics;
- mastering the methods of analyzing the pedagogical activity of a mathematics teacher and introspection of one's own pedagogical activity;

In the course of pedagogical practice, skills are developed to design the content of education, the structure of the upcoming pedagogical process, organizational skills, communication skills are formed in the process of transferring information in the conditions of the classroom-lesson system of training.

The most important structural component of the methodological training of future teachers is specialization and special courses. "We are talking about deepening training in the main specialty of mathematics in the fundamental and applied (including in the field of education) areas of the science of mathematics" [1. P. 46]. Among the special courses, disciplines are considered, focused on the problems of informatization of school education and methods of teaching mathematics. The main purpose of this component of methodological training is to provide in-depth familiarization of students with a certain range of methodological issues, the formation of techniques for the subsequent improvement of knowledge and skills of students.

The independent work of students is of great importance in the process of methodological preparation. One of the important forms of independent activity of students, which includes elements of a research nature, are coursework and graduation theses. The topic and content of term papers can be focused not only on the abstract analysis of literary sources, but also mainly have a research character (for example, the connection with the work of students at school in teaching practice). Graduation works, the most serious and deep pedagogical research, which are a continuation of research coursework, show

the capabilities of the future teacher, his readiness for creative work in school [2].

Thus, methodological training is an important link in the professional training of a future mathematics teacher, in the process of which knowledge of the goals and objectives of teaching a subject at the modern stage of secondary school development, a deep and comprehensive knowledge of existing programs, textbooks and basic teaching aids, theoretical foundations are formed. methods of teaching mathematics, the ability to organize at the level of modern didactic, psychological and technical requirements all forms of educational work in the specialty, to practically carry out the development of schoolchildren in the learning process, to have the skills of managing extracurricular and extracurricular work in the specialty.

The main directions of improving the structure and content of the methodological training of mathematics teachers [3]:

- in the process of creating programs for the methodological training of a teacher, it is necessary to focus on a scientifically grounded model of pedagogical activity of a mathematics teacher;
- reflection in the programs of methodological training of modern trends in the development of the methodological system of teaching mathematics at school;
- the continuity of the specialist training system, an increase in the role of self-education, which is especially important for mathematics teachers in connection with the great dynamism of changes in the methodological system of teaching computer science at school;
- ensuring the maximum possible focus on the individual abilities of students.

Within the framework of the above provisions, we have identified areas for improving the methodological training of future teachers, contributing to the development of their readiness (motivational, theoretical and practical components) to organize the project activities of students.

The first direction of improving methodological training is based on the organization of design and research activities of students as a backbone component of the methodological training of future mathematics teachers for the organization of project activities of students.

Organization of design and research activities of students

Most researchers [4, 5, 6, 7, 8, 9, 10, 11, 12, etc.] are of the opinion that readiness for pedagogical activity is formed and manifested only in the process of the activity itself, is its integral part and determines the effectiveness of its implementation of teaching activities. At the same time, in the process of methodological training, it is necessary to organize conditions for the active inclusion of future teachers in professional activities, on the basis of which the readiness for it and its implementation is formed. One of these conditions is the organization of students' design and research activities.

Preparation for the organization of project activities of students is carried out not only within the framework of methodological training. In the process of

studying other general professional disciplines, the formation of knowledge and skills related to the organization of project activities of students takes place. Students master the pedagogical technology - the "method of projects": basic concepts, stages of organizing an educational project, typology of educational projects, basic didactic conditions for organizing project activities of students;

Design and research activity can be defined as a specific form of organization of the educational process at a university. The organization of design and research activities is an effective means of forming a subject-subject type of interaction between participants in the educational process, in which there is mutual influence, mutual enrichment of its participants, recognition of the uniqueness of subjective experience as the most important source of creative self-development [13. P. 116]. In this case, the position of the teacher changes: the object of his influence is not the student, but his educational activity. This approach allows the student, together with the teacher, to carry out creative, independent-cognitive, project activities.

Thus, we consider design and research activity as a backbone element of the process of methodological preparation of future mathematics teachers for the organization of project activity of students. The system-forming role of students' design and research activities in the process of methodological training is manifested primarily:

- in updating the knowledge and skills of students related to design, obtained in the process of studying general professional disciplines and disciplines of the subject block.
- in the possibility of implementing the continuity of the components of methodological training

At the same time, students not only gain experience in project activities as project participants, but also from the outside observe the activities of the project manager, which they have to master. The actualization of knowledge and skills occurs through the allocation and solution of problems arising in the course of the project.

That is why another direction of improving methodological training is the inclusion in the content of students 'design and research activities of special educational and methodological tasks that form the knowledge and skills of students related to the organization of students' project activities in the process of teaching basic and profile mathematics courses.

The implementation of the activity approach in specific methods is expressed, on the one hand, by using the method of appropriately selected tasks and, on the other hand, by assessing the level of knowledge of trainees in terms of skills and abilities to solve a particular problem [14].

The term "task" is interpreted in the scientific literature broadly and ambiguously: "a task is a goal given under certain conditions" [9. S. 107]; "a task in its most general form is a system, the mandatory components of which are: a) the object of the task, which is in the initial state ..., b) the model of the

required state of the object of the task" [15. P. 32]; a task is a symbolic model of a problem situation created by the subject as a result of mental analysis [16. P. 81].

Among all the variety of educational tasks, applied tasks are distinguished, which in their formulation and methods of solution are close to the tasks arising in practice. M.V. Krutikhin, under an applied task, understands a problem formulated in the form of a task that satisfies the following requirements:

- the question should be posed in the form in which it is usually posed in practice, since the solution should have a practical focus;
- the sought and given values (if they are specified) must be real, taken from practice. Based on this definition, we can conclude that applied tasks are most often problematic.

The teacher's activity is associated with the constant solution of methodological problems: the selection of theoretical and practical material, the choice of teaching methods and lesson structure, the use of the necessary means, etc.

Based on the general concept of "methodological task" T.A. Boronenko defines the concept of "educational and methodological task", the conditions of which are formulated on the basis of the needs of a real educational process. The tasks offered to students in the framework of methodological training are called educational-methodical tasks [14]. In this regard, we have developed educational and methodological tasks that allow you to effectively form the knowledge and skills of students related to the organization of project activities of students in mathematics lessons. These educational and methodical tasks are truly applied; production character, since their content reflects the problems that arise in the direct work of the teacher. Educational and methodological tasks are problematic, since they allow organizing purposeful, independent, search-oriented activities of future teachers in the absence of solutions.

Didactic requirements

The following didactic requirements were laid down as the basis for the design of educational and methodological tasks:

- building a typology of educational and methodological tasks in accordance with the structural components of the teacher's pedagogical activity (constructive, organizational, communicative, gnostic);
- the content and methods of activity, assumed by the educational and methodological tasks of organizing the project activities of students, should be focused on the formation of general methodological and special methodological skills of a mathematics teacher;
- the solution of the problem should reflect the results of each stage of organizing the project activities of students.

Let us consider these didactic requirements in more detail.

1. Building a typology of educational and methodological tasks in accordance with the structural components of the teacher's pedagogical activity (constructive, organizational, communicative, gnostic). According to A.I. Mishchenko, the educational and cognitive activity of future teachers should be organized as a process of solving educational problems; aimed at learning the patterns, principles, methods of organizing the educational process and mastering the main types of pedagogical activity. In this regard, a classification of educational and pedagogical tasks is proposed, based on the structural components of pedagogical activity, identified by N.V. Kuzmina [10]: constructive, organizational, communicative, gnostic. We used this approach in the process of developing a typology of educational and methodological problems.

2. The content and methods of activity assumed by the educational and methodological tasks of organizing the project activities of students should be focused on the formation of general methodological and special methodological skills of the teacher of mathematics. Analysis of the psychological and pedagogical features of the teacher's activities related to the organization of students' project activities; didactic tasks of the effective organization of project-based teaching facing the teacher of mathematics; typology of educational projects in mathematics allowed us to single out generalized methodological skills that characterize the theoretical and practical components of the readiness of the mathematics teacher to organize the project activities of students.

Pedagogical skills, according to O.A. Abdulina, assume ownership of the activity. “The process of mastering an activity is the mastery of targeted actions, the operational composition of actions, the principles of choosing methods of action on the basis of an indicative basis of actions, awareness of methods of action” [4. P. 76].

In this case, by methodological skills we mean the totality of the teacher's successively unfolding actions, based on theoretical knowledge and aimed at solving learning problems [17].

Since teaching can be characterized by one or another teaching method, and each method can be represented by a system of pedagogical techniques, then, concretizing the definition of methodological skill, it can be argued that this ability to apply the technique of the corresponding method in the process of solving a didactic problem.

In work [18] B: A. Dahlinger examines in detail various approaches to the classification of teacher’s methodological skills. The first approach is based on considering the components of the teacher’s pedagogical activity and determining the appropriate methodological skills. The second approach “is characterized by the allocation of invariant and variable components in the structure of the teacher's methodological activity, and, accordingly, general skills necessary for each teacher, and specific skills inherent in the teacher of certain

academic subjects" [18. P. 168]. Representatives of the third approach list methodological skills without distributing them into groups.

Taking the first and second approaches to the classification of methodological skills as a basis, we identified the composition of general methodological and special-methodological skills of a mathematics teacher and distributed them in accordance with the types of pedagogical activity.

3. The solution to the problem should reflect the results of each stage of organizing the students' project activities. The process of organizing the project activities of students is a kind of methodological project, which, like any project, involves the creation of a product. At each stage of his project activity, the teacher achieves specific results. So in the process of designing and constructing an educational project, the teacher chooses educational problems, formulates the didactic goals and objectives of the students 'project activities, plans the stages of the educational project and projects the directions of students' research activities in the course of solving educational problems.

General methodological skills of the mathematics teacher in organizing the project activities of students

1) In the design and construction of the project:

- the ability to embed project learning into the general structure of the educational process;
- the ability to formulate, clarify the goals and objectives of project activities: intellectual, moral, cultural development of students;
- the ability to choose the topic of projects from the entire content of the studied discipline, which is relevant for the practical life of students and takes into account the attraction of knowledge from different areas;
- the ability to determine the type of project for a specific topic;
- the ability to identify and formulate significant research, creative issues (tasks) that require integrated knowledge;
- the ability to formulate a hypothesis for solving a problem;
- the ability to identify structural components, stages of a project, depending on its type, with an indication of intermediate results;
- the ability, when drawing up a plan for a project, to adapt design tasks (research, creative, practical), taking into account the level of preparation of a particular class;
- the ability to identify the necessary means of training or ensuring interaction during the project;

2) In the organization of the project

- the ability to stimulate students' interest in certain problems of the studied subject area;
- the ability to create a problematic situation at the stage of setting the tasks of the project to the students;
- the ability to organize the independent activity of students (individual, practical, group);

- the ability to organize external and self-assessment of students' project activities (intermediate results);
- the ability to timely adjust the progress of the project, depending on the intermediate results;
- the ability to organize their own activities for the effective complex application of didactic and information teaching aids;

3) In communication activities during the project

- the ability to create an atmosphere of cooperation and mutual assistance in the student-student, student-teacher mode;
- the ability to organize an independent discussion in groups aimed at choosing research methods, formulating reasoned conclusions;
- the ability to organize a discussion of the obtained data.

4) In gnostic activity

- the ability to analyze pedagogical situations that have arisen during the course of the project;
- the ability to evaluate the effectiveness of the applied methods, techniques, means in project training;
- the ability to identify the causes of successes and failures, mistakes and difficulties in the implementation of the set didactic tasks;

In the process of carrying out the project, the teacher creates problem situations, together with the students formulates project tasks, organizes the students' independent activity to find solutions to the problems posed, conducts an external assessment of the students' project activities (intermediate results), etc. Important at this stage of the project are the communicative skills of the teacher, associated with the creation of an atmosphere of cooperation and mutual assistance in the course of the project activities of students. At the final stage, the teacher must evaluate the effectiveness of the applied methods, techniques, means in project-based learning. To do this, he needs to develop criteria for assessing students' work, to select methods for assessing the learning process.

Conclusion

Thus, having considered the basic didactic requirements for the design of special educational and methodological problems, we can give the following definition. By an educational and methodological task, the solution of which contributes to the development of the readiness of future mathematics teachers to organize the project activities of students, we will understand the task proposed to the student in the framework of design and research activities in the process of methodological training, the condition of which characterizes the components of the activity of a mathematics teacher , and the decision corresponds to the result of this activity.

Considering such a problem, the future teacher of mathematics must not only find its solution, but also determine rational ways of analyzing the problem situation described in the problem and ways of solving it. Therefore, the cognitive activity of students in this case is of a design and research nature, and

the teacher's activity should be aimed at organizing an independent analysis by students of the formulation of an educational and methodological problem and organizing a discussion of the results of the analysis and developing approaches to solving it.

The considered directions of improving the methodological training of future mathematics teachers are the basis for supplementing and improving the methodological system of preparing students for the organization of students' project activities.

References

1 Lapchik, M.P. The structure and methodological system of training staff for the informatization of schools in pedagogical universities. Thesis in the form of a scientific report for the degree of Doctor of Pedagogical Sciences. - Moscow, 1999. – 82 p.
2 Sorokin, N.A. Diploma works in pedagogical universities. Moscow: Education, 1996, 127 p.
3 Kuznetsov, A.A., Kariev, S. The main directions of improving the methodological training of teachers of informatics in pedagogical universities // *Informatics and education*, 6 (1997): pp. 13-19.
4 Abdulina, O.A. General pedagogical training of teachers in the system of higher pedagogical education: For ped. specialist. higher. study. establishments. - 2nd ed., Rev. and additional - M.: Education, 1990. – 141 p.
5 Verbitsky, A.A. About contextual learning // Bulletin of the higher school. - 1984. - No. 8.
6 Garunov, M.G. Research on the problems of enhancing the independent work of students in the country's universities. - ITsVSh, M., 1976.
7 Zhaldak, M.I. The system of teacher training for the use of information technology in the educational process. Abstract of thesis. dis doct. ped.
8 sciences. M. 1989. – 48 p.
9 Kuzmina, N.V., Rean A.L. Professionalism of teaching activities. SPb., 1993. – 323 p.
10 Leontiev, A.N. Activity. Consciousness. Personality, 2nd edition. Moscow: Politizdat, 1997. – 107 p.
11 Mishchenko, A.I. Formation of the teacher's professional readiness for the implementation of a holistic pedagogical process. Diss. ... doct. ped. sciences. Moscow, 1992. – 487 p.
12 Reshetnikov, P.S. An unconventional, technological system of teacher training: the birth of a master. Book for teachers of higher. and average ped. study. institutions. - Vlados, 2000. – 304 p.
13 Shcherbakov, A.I. Some issues of improving subteacher's cooking // Soviet pedagogy. - 1971. - No. 9.

14 Ratt, T.A. Formation among students of a pedagogical university of readiness for the development of creative potential. Dis. ... Cand. ped. sciences. Perm, 2000. – 211 p.
15 Boronenko, T.A. Model of the system of methodological training of a teacher of informatics. Dis. ... doct. ped. sciences. Moscow, 1998. – 335 p.
16 Ball, G.A. Theory of educational tasks. M .: Pedagogika, 1990 .-- 184 p.
17 Pidkasisty PI, Fridman LM, Garunov MG Psychological and didactic reference book of a teacher of higher education. M .: Pedagogical Society of Russia, 1999. – 354 p.
18 Slastenin, B.A., Isaev, I.F., Mishchenko, A.I., Shiyanov, E.N. Pedagogy: a textbook for students of pedagogical educational institutions. – M.: School-Press, 1997. – 512 p.
19 Dalinger, V.A. Methodological skills as a component of the professional competence of a mathematics teacher / Problems of the quality of training of specialists in the system of higher pedagogical education: Materials of a scientific and methodological conference / Edited by I.P. Gerashchenko. - Omsk: Publishing house of OmGPU, 2003. – pp. 160 - 174.