

PROFESSIONAL-ORIENTED TASKS AS A MEANS OF IMPLEMENTING THE PRINCIPLE OF PROFESSIONAL ORIENTATION OF MATHEMATICS EDUCATION IN TECHNICAL INSTITUTIONS OF HIGHER LEARNING

Majidov Shodi

Lecturer at Jizzakh State Pedagogical Institute
REPUBLIC OF UZBEKISTAN

ABSTRACT

In this article the concept of "professionally-oriented problem" is considered as a problem representing an abstract model of some real situation arising in professional activity, solved by mathematical methods or methods applied in the professional activity of future specialists and contributing to the development of the personality of the future specialist, based on the analysis of research papers devoted to the application of professionally-oriented problems in mathematics education at technical universities.

Keywords: Professional orientation of training, professionally oriented tasks, competent approach, mathematics, professionally oriented project, professional training.

INTRODUCTION, LITERATURE REVIEW, METHODOLOGY

Over the past decade, education has been modernized with the main objective of improving the quality of training. Leading professionally essential qualities of a specialist in modern society are his professional competence, competitiveness, ability to effectively solve tasks in a wide range of social, professional and life situations. In this regard, a unique role is given to updating the content of vocational education to bring it into line with the requirements of society and the labor market, rethinking the goals and results of education.

The term "competence" refers to the ability to apply knowledge, skills, attitudes and experience in familiar and unfamiliar work situations. The essence of the concept lies in its complex nature - the integration of knowledge, skills, values, attitudes and relationships that are equally important for the performance of professional activities. The central aspect of competence is the ability to carry out an activity, both familiar and new, based on the organic unity of knowledge, skills, experience, attitudes and relationships, etc. Experience is defined as that life and professional content that is understood and developed by a person and has become part of his inner world. An employee starts to possess professional and managerial experience only when he or she analyzes the results of his or her activities and draws the right conclusions. Competency-based training is understood as "training based on defining, mastering and demonstrating knowledge, skills, types of behaviour and relationships necessary for a specific work/occupation". The key principle of competency-based learning is an orientation towards results relevant to the world of work [3].

The competent approach in learning dictates the need to pay special attention to the principle of professional orientation of learning, because its task is to resolve the contradiction between the theoretical nature of the disciplines studied and the practical ability to apply this knowledge in professional activity, which, realizes the competent approach in learning.

The majority of researchers see the solution of professionally oriented problems as the main means of realization of the professional orientation of education.

RESULTS, DISCUSSION

In pedagogical research, there are several definitions of professionally oriented tasks. O. V. Bochkareva understands the professionally-oriented mathematical problem as a problem, the condition and requirement of which "determine a model of some situation, which arises in the professional activity of an engineer, and the investigation of this situation is carried out by means of mathematics and contributes to the professional development of the personality of a specialist" [1]. In the paper, N. V. Skorobogatova "Professionally-oriented problem is a problem representing an abstract model of some real situation arising in the professional activity of an engineer and solved by means of mathematics, in the plot of which the possibility of varying conditions, procedures and results is laid down" [6]. The first definition is given in relation to the tasks offered to students not of a technical profile, the other two definitions are given in relation to the technical profile, but to the university. L. V. Vasiak understands a professionally oriented problem as a problem, the condition and requirement of which "determine a model of some situation arising in professional activity... and the research of this situation is carried out using mathematics and contributes to the development of a specialist's personality" [2].

Analyzing these definitions, it is possible to conclude that two directions of professionally oriented tasks are standard for them: substantial and procedural.

The first direction characterizes the content of the task in terms of professional content. It is realized through the fable of the task, which arises as a result of a specific situation related to the professional activity or simulates it. The second direction is connected with the methods applied in solving the task. In these definitions, it is stated that the task represents a model of a situation arising in professional activity, but it is solved mathematically by methods. The listed directions promote the formation of professional competences of students, but the study of mathematics should form general competences of future specialists. In this connection, it would be expedient to include the third direction-development in the approach to defining professionally oriented tasks. It can be implemented by increasing the motivation of teaching through the content of the problem and methods of its solution, to develop personal qualities of the student: observation, different types of thinking, memory, attention, etc.. Thus, a professionally oriented task will be understood as a task representing an abstract model of some real situation arising in professional activity, solved by mathematical methods or methods applied in the professional activity of future specialists, and contributing to the development of the future specialist's personality.

Defining the type of professionally oriented problem, we will be guided by the classification proposed in the study of I.G. Mikhailova, which distinguishes two main types of problems: "The first type is the problem in which professional concepts and terms are used to give mathematical concepts special meaning. The second type is tasks that put a student in some professional situation that requires the use of mathematical methods. Tasks of the first kind are most often used as motivational tasks in building a mathematical model and presenting new material. Tasks of the second kind allow to develop professional thinking of a student, to prepare him/her through mathematics for the future professional activity and to increase interest in mathematics directly" [4].

The notion of "professionally oriented problem" is a type of problem in relation to the more general notion - applied problem. An applied problem is a problem defined outside mathematics and solved by mathematical means. Any professionally oriented problem has an applied character as it allows solving the issues arising out of mathematics by mathematical methods. It is necessary to note also a special property of profession-oriented problem: the same problem for different categories of pupils can have only applied character for some and profession-oriented character for others. So, for example, the problem on calculation of durability of a beam, solved by means of the differential equations, for students of a technical profile will be professionally focused as its faculty is focused on sphere of professional activity, and for students of a specialty "Informatics", it will have only applied character as it is not connected with their professional activity.

Under the complex of professionally oriented tasks, we will understand the tasks selected on a certain topic of a certain mathematics section, including professionally significant content from the field of future professional activity. To include a set of professionally oriented tasks in the educational process of a mathematics course, it is necessary to perform the following steps: to select the necessary theoretical material from the subject area of mathematics; to establish all kinds of inter-subject links between mathematics and practical applications related to the future professional activity from the subject area of special and general professional disciplines. The solution of professionally oriented tasks of different types helps students to master basic mathematical concepts in combination with professional terms and is one of the main teaching functions. It is the systematic use of a set of mathematical concepts in conjunction with professional terms that gives an opportunity to deepen professional orientation in mathematics teaching. It is important to note that students, solving professionally oriented tasks during the whole course of mathematics, simultaneously study mathematics and learn to apply the acquired knowledge in their future professional activity, which corresponds to the requirements of state standards for mathematical education in the process of professional training of future specialists. Therefore, the introduction of complex professionally-oriented tasks in the content of the mathematics course at all major stages of education is one of the effective methods of teaching the discipline of "mathematics", which contributes to improving the quality of professional training of future specialists. Thus for this kind of tasks, we will put forward the following requirements: accessibility of modeling: at the stage of building a mathematical model of the students should be able to build a mathematical model of the problem. To achieve this requirement, the teacher may have to immerse students in the subject environment set out in the problem. Drawing up of methodical recommendations on construction of a model gives the chance to apply such problems at studying of various themes of a mathematics course; the technical faculty of a problem promoting motivation of studying of a corresponding mathematical material; a target orientation: the decision of problems should promote strong assimilation of mathematical knowledge, receptions and the methods being a basis of professional activity; the inter subject character of problems which is shown either in condition or in the course of the decision.

Application of professionally oriented tasks at each stage of training carries out the certain function: the carrier of new professionally significant knowledge and ways of actions at a stage of studying of a new material and as a form of submission of the professionally directed content; a means of realization of a method of mathematical modeling which is one of the most important methods of training of mathematics at all stages of training; motivating function which is provided by a technical faculty of a task, professionally oriented tasks are provided by a technical faculty.

At the stage of extra-curricular independent work of professionally-oriented tasks can act as a part of the task, which is solved after practicing the skill of solving tasks with purely mathematical content. Inclusion of professionally oriented tasks at the control stage allows to diagnose students' possibilities to apply the received knowledge and skills in professional activity, which is the requirement of the state educational standard to the results of the discipline "Mathematics".

Systematic use of professionally-oriented tasks at all stages of education allows to maintain a high level of educational motivation of students, which is achieved through the formation of a sustainable interest in the discipline of mathematics and special disciplines studied in the specialty. The pedagogical experiment has shown that the use of professionally oriented tasks leads to an increase in the degree of assimilation of mathematical knowledge. The main mechanisms through which professionally-oriented tasks affect the formation of mathematical knowledge and skills are as follows: a high degree of students' motivation; implementation of the correspondence column, which performs special didactic objectives of students' education in technical higher education institutions; adequate selection of the content of mathematical education and methods of its development based on didactic model of professionally-oriented mathematics education in technical higher education institutions. More general in relation to the concept of professionally-oriented task is the concept of professionally-oriented task. By professionally oriented task we will understand the task, in the course of which the professional activity of the future specialist is modeled. In technical higher education institutions, we will distinguish three types of professionally oriented tasks: professionally oriented tasks, tasks for laboratory work, professionally oriented projects. Each type of task is used in a certain form of educational process organization, with the use of specific methods and teaching aids. Performing its pedagogical functions, each type of task has its mechanisms of influence on the educational motivation and learning of mathematical knowledge and skills. It is for these reasons that we consider three types of professionally oriented tasks, although they are all united by a common feature - the connection of mathematics with special disciplines and future professional activity. In further research, the developed academic model is based on the concept of a set of professionally oriented tasks. Under the complex of professionally oriented tasks, we will understand all types of tasks, compiled throughout the course discipline "Mathematics", allowing to implement the relationship of mathematics with special disciplines, and modeling elements of professional activity of future specialists. A special place in the implementation of the principle of professional orientation in higher education institutions of technical profile takes such a form of educational process organization as laboratory work with the use of application software packages.

Modern computer equipment and used programs allow solving purely mathematical problems, avoiding cumbersome and tedious calculations. The need to perform complex numerical calculations and calculations arising in the solution of many engineering problems requires from a specialist not only the surface ability to work with a primitive calculator, but also much more complex knowledge and skills. Laboratory work in mathematics has its specifics that distinguish them from work, for example, in physics or chemistry. There is no need for expensive and complex equipment, no need to conduct some practical experiments. On the other hand, as mentioned above, these works are associated with the need to perform complex and cumbersome calculations. Ability to possess computational skills and computing equipment is a distinctive feature of technical intelligentsia. Experience shows that often students rarely work with applied programs and they know the possibilities of even such common programs as Microsoft Excel rather superficially. That is why, while performing laboratory work on mathematics, students not only consolidate their theoretical knowledge on

the relevant sections of mathematics but also develop the skills of using such powerful software products as Microsoft Excel, MathCAD. It seems to us that the main positive result of properly performed laboratory work is that the student has sufficiently mastered the method of solving mathematical problems set out in work—ability to make calculations correctly, though it is important, but certainly, secondary.

In a basis of the construction of a cycle of laboratory works on mathematics with an application of packages of applied programs on specialties of a technical profile the following requirements were put: the account of the specificity of specialty; the differentiated approach; interrelation of theoretical knowledge and practical skills; a professional orientation. The structure and content of laboratory works perform the following functions: teaching: learning of theoretical material and mathematical methods of problem solving, strengthening the mathematical training of a specialist; developmental: development of research skills; education: responsibility, accuracy, attention, ability to work independently and in a team; motivational: development of cognitive interest and interest in the chosen specialty.

Mechanisms of influence of laboratory works on formation of mathematical knowledge and skills, the following: maintenance of a high degree of educational motivation of students through inclusion of students into the field of professional activity; possibility of successful performance of the task only through adequate mastery of the mathematical method of problem solving; availability, speed, clearness of the decision, on a stage-by-stage performance of the task; the content of laboratory works adequately didactic model of professionally-oriented mathematics teaching in the higher educational establishments; the possibility of the successful performance of the task only through adequate mastery of the mathematical method of problem solving; the availability, speed, clearness of the decision, on a stage-by-stage performance of the task; the content of laboratory works adequately didactic model of professionally-oriented mathematics teaching in the higher educational establishments.

At the organization out of classroom independent work, the principle of a professional orientation is realized at the expense of the solution of professionally-oriented tasks and performance of professionally-oriented projects. Under the project, we will understand such a form of educational activity organization, which provides for the complex character of activity of all its participants in obtaining educational products for a certain period. This definition is given by A.V. Khutorskii [7-9]. Among the many classifications of projects, there is a classification by the dominant type of activity proposed by E. Khutorskii [7-9]. C. Polat, in which applied or practice-oriented projects are distinguished [3]. A distinctive feature of this type of projects is a clearly defined result of the activity from the very beginning, oriented to the social interests of the participants themselves, which requires a well-thought out structure, a scenario of all the activities of its participants with a definition of the function of each of them.

We will highlight one of the varieties of this kind of project - a professionally oriented project. Taking into account the definition of the project and the principle of professional orientation under the profession-oriented project, we will understand the form of organization of students' learning activities to create, research and implement mathematical models that are important in the professional activities of future specialists. Work on the project contributes to the formation and improvement of professionally important qualities of the future specialist. We distinguish two types of professionally-oriented project in the system of professionally-oriented mathematics education: substantial and procedural. Under the meaningful projects, we will understand the projects on implementation of mathematical models on the content of

related special disciplines. Examples of such projects can be: "Solution of systems of linear equations at calculation of currents in a chain", "Solution of systems of the linear equations at the solution of optimization problems", "Solution of systems of the linear equations at calculation of final probabilities", "Execution of actions with complex numbers at calculation of currents in a chain", and so on.

Procedural projects mean the realization of the constructed mathematical model by the methods applied in a professional activity: ready applied programs or development of its program product. As a professionally oriented project in the system of professionally oriented mathematics training the following functions are performed: teaching: mastering of theoretical material and mathematical methods of problem solving, strengthening of mathematical training of a specialist, mastering of theoretical material from related disciplines; developing: develops research skills, algorithmic thinking of students, develops professionally important qualities of personality of future specialists; educating: brings up a sense of responsibility for the result. Influence of professionally oriented projects on formation of mathematical knowledge and skills is carried out by the following mechanisms: maintenance of high degree of educational motivation by means of applied orientation of projects and inclusion of students into the field of professional activity; realization of the column of correspondence between the themes of mathematics and special disciplines, aimed at achievement of didactic goals of professionally oriented teaching of mathematics of students of higher educational institutions of technical profile; enrichment of the student with the knowledge of mathematics of students of higher educational institutions.

CONCLUSIONS

Thus, the solution of professionally oriented problems in mathematics education not only increases the motivation of students to study this discipline but is also an effective means of implementing interdisciplinary relationships in the process of training future specialists in the technical field. At the same time, the efficiency of education and upbringing is increased, and the possibility of transversal application of knowledge, skills and abilities acquired during classes in different disciplines is provided. Academic disciplines in a sense begin to help each other, and strengthening of interdisciplinary links leads to internal and external harmonization of all elements of the system of professional training and actively works to ensure the readiness of students of technical higher education institutions for their future professional activity.

REFERENCES

1. Bochkareva, O. V. Professional orientation of teaching mathematics to students of engineering and construction specialities of the university: Author's thesis... PhD of ped.sciences: 13.00.08. - Saransk, 2006. – p.17.
- 2 Vasiak, L.V. Formation of professional competence of future engineers in the conditions of integration of mathematics and special disciplines by means of professionally oriented problems]: PhD of ped.sciences. - Omsk, 2007. - p. 9.
3. Drakina, I.K. Teaching and methodical manual for the course "Analysis of professional competencies and development of modular educational programs based on competencies". -St. Petersburg, 2008. – p.50.
4. Mikhaylova I.G. Mathematical training of engineer in the conditions of professional orientation of interdisciplinary relations: monograph. - Tobolsk, 1998. – p.172.
5. Polat, E.S. Project method [Electron resource] // Laboratory of distance learning. - Access Mode: <http://distant.ioso.ru/project/meth%20project/metod%20pro.htm>.

6 Skorobogatova, N.V. Professional modeling focused on mathematical problems in teaching math to students engineering directions of technical universities: the dissertation...cand. ped. of sciences :

13.00.02 - Yaroslavl: 2006. – p.183.

7. Khutorskiy, A. V. Key competencies as a component of personal-oriented education // People's Education, 2003. - № 2.

8. Khutorovka, A. V. Modern didactics: training for higher education institutions. - St. Petersburg, etc. (in Russian) // People's Education, 2003. St. Petersburg, etc. : Peter, 2001. – p.544.

9. Khutorskoi, A. V. The technology of design of key and subject competences [Electron resource] //Internet magazine "Eidos". -2002 Access mode <http://www.eidos.ru/journal/2002/0423.htm>.