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Using a problem-based approach to improve the professional readiness of students of physical and mathematical specialties

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Abstract. The use of a problem-based approach in the preparation of students of physical and mathematical specialties allows them to acquire new skills, abilities and knowledge in the process of learning by solving various professional problems. This requires the use of various available information resources.

Problem-oriented training provides an opportunity to acquire the skills of information retrieval and creative problem solving. During problem-oriented training, students have the opportunity to acquire the skills of teamwork and search for non-standard ways to solve problematic issues. Professional readiness is an integral indicator of the quality of training of a specialist and the level of skill in accordance with the requirements that his professional activity puts forward. Problem-oriented learning encourages students to search for the required information from various sources. In addition, the information sought can be interdisciplinary. Problem-oriented training contributes to the improvement of professional readiness of students of physical and mathematical specialties.

1. Introduction

Recently, much attention has been paid around the world to the training of specialists who have the skills to independently improve their professional skills, this is primarily due to the current conditions of socio-economic social development. According to [1] the ability to independently acquire the necessary knowledge is important for improving the level of competence of a modern specialist.

According to [2] a person during self-education, comes into contact with assessments and ideals correlated with personal values.

According to [3, 4], self-education is characterized by: subjectivity, organization, independence, a large selection of possible methods and forms, as well as self-learning.

According to [5], [6] the individual is able to be the architect of his cognitive activity, set goals for himself, and independently plan actions to achieve these goals.



Educational student activity is closely connected with the processes of self-education and cognition. According to [7] self-education is an educational process that is characterized by an understanding of the need for education, self-realization and purposefulness in acquiring new knowledge.

According to [8] modern professionals should have the skills to solve problematic and creative tasks related to their professional activities.

Therefore, in our opinion, it is worth considering the problem of the specialist's readiness to carry out his professional activity, as well as ways to improve this readiness.

2. Methods

In carrying out this study, we used an analytical method, which allowed us to consider the studied problems in their development and unity. Taking into account the tasks and goals of the study, the structural and functional method of scientific research was applied. This ultimately allowed us to study a number of problems related to improving the professional readiness of students of physical and mathematical specialties.

3. Results

Professional readiness according to [9] can be considered on the basis of the principle of unity of activity and personality in relation to external and internal factors. According to [10] professional readiness is the sum of skills, abilities and knowledge. According to [11] professional readiness consists of the individual's ability to mobilize intellectual and other resources to perform a specific professional activity. According to [12] professional readiness is closely related to the activity of a specialist, is formed by his professional activity and is one of its components.

In the work of [13] it is noted that professional readiness consists of the following components (figure 1):

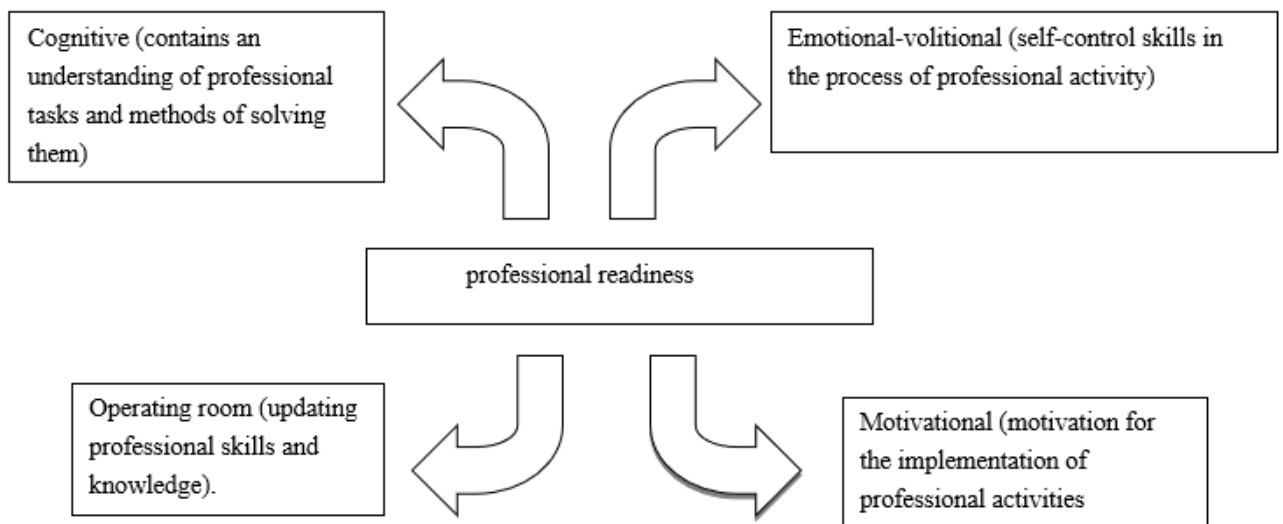


Figure 1. Professional readiness of a graduate of a higher educational institution.

According to [13] professional readiness depends on motivation for future professional activities, needs and personality traits. In the work of [14] professional readiness refers to the various qualities of a particular person that determine the readiness of this person for professional activity. Such qualities, in our opinion, include a wealth of internal energy, emotional stability, initiative, development of professional thinking, which allows you to analyze your professional activities.

According to Sari, [15] professional readiness includes the style of professional thinking, the General state of the individual, moral characteristics, professional and civic position. The authors [16]

understand professional readiness as a versatile education of an individual. It provides for the presence of a person with a certain level of professional competence and professional skill, self-regulation skills and the ability to use their knowledge base to solve various tasks related to professional activity.

According to [13] professional readiness is an integral property of a person, reflecting his ability to use his skills, knowledge and abilities.

Based on the analysis, we came to the conclusion that professional readiness is an integral indicator of the quality of training of a specialist and the level of skill in accordance with the requirements that his professional activity puts forward.

In our opinion, an effective tool for improving the professional readiness of students of physical and mathematical specialties is the use of problem-based learning for their training. The decision of a problem situation associated with understanding of the problem, its solution and drafting.

According to [16] solving a learning problem encourages the student to find ways to solve the problem, forms the skills of working with information sources and motivates them to acquire new knowledge, skills and abilities.

When solving problem situations, as a rule, choose one of three solutions (figure 2):

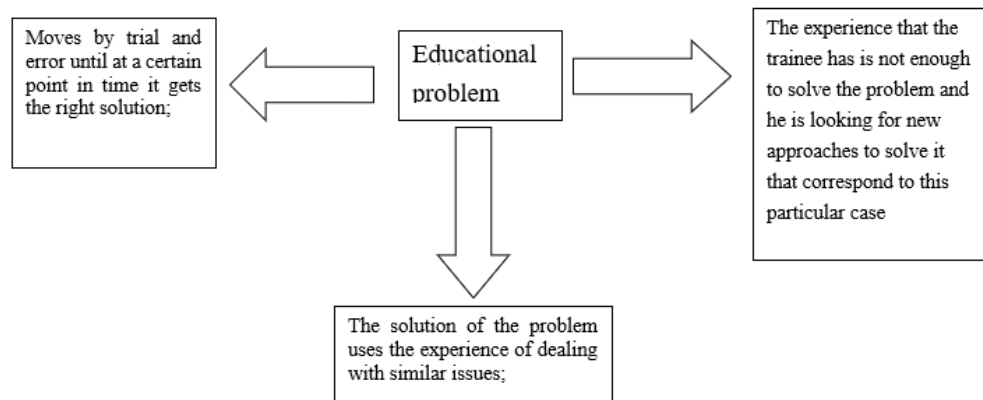


Figure 2. Options for solving the educational problem by students.

In our opinion, for use in the study of physical disciplines, the problematic presentation of educational material contributes to the activation of students' mental activity. This is its advantage over the traditional illustrative-educational method of teaching. As a result of the problem presentation, students are immersed in the atmosphere of creativity and the search for new knowledge.

As an example of a problem presentation of educational material, the use of a problem statement in the final stage of the training session, for which the students do not have enough necessary knowledge, is considered. This will encourage them to find the necessary information to solve the problem, or they will look forward to the next lesson.

When using the problem presentation of the material for teaching physical disciplines, you can use the method of sequential approximation. In this case, the problem is divided into several independent tasks and students consistently solve these independent tasks and thereby achieve a solution to the entire problem as a whole.

As for the problem studies of physical disciplines, it is possible to use the method of surveys. In the course of these surveys, the student must independently understand the question proposed to him. Before carrying out such surveys, the teacher needs to come up with questions to answer which the student is required to carry out an independent search for a solution and thereby have a stimulating effect on the cognitive activity of students.

In addition to questions, in our opinion, it is necessary to develop hints to them to help students in case their search goes on the wrong path.

At the same time, the survey method has a disadvantage due to the different level of initial training of students in the field of physics, the difference in their interests and abilities for creative activity.

To eliminate this problem, in our opinion, it is possible to take a differentiated approach to the survey of students and ask more complex questions to students with better training.

For the practical implementation of problem-based teaching of physical disciplines, it is also possible, in our opinion, to ask students to put forward a hypothesis as a solution to the proposed problem, which they must prove and justify.

The use of problem-based teaching of physical disciplines, in our opinion, is advisable to make when conducting a laboratory workshop. During experimental studies, the student makes an understanding of the obtained experimental data and correlates them to the conclusions of the theory. This allows students to acquire independent skills in solving applied professional problems.

In our opinion, it is very important to rely on the knowledge base acquired by students earlier when implementing problem-based teaching. They can be based on previously studied material or practical life experience. If this is ignored, the trainees will most likely not be able to find a direction for the correct solution of the problem posed to them.

4. Discussion

Problem-oriented training allows students to reach the educational material, but also to learn the ways of obtaining knowledge, forms the skills of cognitive and creative activity in students. Problem-based learning with the appropriate organization of the educational process contributes to the formation of students' propensity for problem-based activities. In our opinion, important functions that are characteristic of problem-based learning include:

- Gaining experience in problematic creative activities
- Formation of creative skills using skills and knowledge to solve educational problems.
- Acquisition of skills to acquire new knowledge.

Problem-oriented learning encourages students to search for the required information from various sources. In addition, the information can be interdisciplinary. Thus, problem-oriented training increases the readiness of future specialists of physical and mathematical specialties for professional activity.

Problem-oriented education allows students to independently choose ways to solve a problem situation. This allows you to acquire skills at all stages of work, and also contributes to the development of critical thinking, teamwork skills, the ability to make decisions and take responsibility for these decisions is formed.

Teamwork allows you to improve communication skills, promotes an objective assessment of your knowledge.

5. Conclusions

Problem-oriented learning is a pedagogical technology that provides for the acquisition of new knowledge, skills and abilities by solving specific professional problems with the maximum use of available information resources. It allows you to achieve a full assimilation of educational material and additionally acquire the skills of searching and processing information necessary to solve the problem.

Problem-oriented learning is characterized by:

- A small number of lectures.
- The study of the subject provides for the solution of professional problems that have a practical orientation.
- The student independently searches for the information required to solve the problem.
- The problem is Solved by the trainee independently or while working in a team.

Problem-oriented learning motivates students to search for information on their own. Analyze it and use it to solve specific professional problems. In the process of problem-oriented learning, students acquire the skills of working in a team, learn to look for non-standard ways to solve problem situations.

Through the use of problem-based learning during the course of the educational process, conditions are formed that encourage students to use the existing knowledge base to independently investigate the educational problem and look for the best solution. This allows you to develop the creative potential of students.

The basis of problem-based learning is based on solving non-standard educational and professional problems. In the process of solving which the student has the opportunity to acquire new skills and knowledge, as well as experience in professional and research activities.

Problem-based learning stimulates the development of analytical thinking, promotes the formation of students' independence and perseverance on the way to achieving the intended goal.

During problem-based learning, students take an active part in the learning process, which further motivates them to acquire new knowledge and skills. The effectiveness of the proposed method largely depends on the problem chosen for the study, on how interesting the work will be for the trainees.

In the process of problem-based learning, the teacher, in our opinion, should try not to impose his point of view on the students, but only to assist them in solving the problem independently

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