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Principles of Selection of Materials on the Problem Method of Teaching Physics in Secondary Schools

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ABSTRACT
The article presents the ways of using the problematic situation method in teaching physics, choosing the materials that support the problematic teaching method. In order for students to deeply master physics, the choice of separate materials for solving more issues and performing laboratories gives good results. The article presents a wide range of methods of using problematic teaching techniques in teaching physics and found its confirmation in the results obtained.

Keywords: creativity, activity, motive, goal, tool, event, process, feature, system, method, direction, mexanizm, result, problem.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Our pedagogical experience and testing have shown that at present, physics is widely used in all spheres of everyday life. Therefore, students should acquire basic knowledge of physics from school [1]. It is important for the teacher to know the choice of problematic materials according to the purpose in terms of content and essence that underlies the importance of scientific direction and instructional materials that are oriented towards a particular purpose, methodically based, having a clear idea [1, 2]. Consequently, the teacher consists not only in collecting the necessary information on the questions in the program, but also in searching for the necessary techniques in order to systematize it, introducing students in the lesson and extracurricular activities[5].

From our observational and pedagogical experience, it is known that in the problematic teaching of physics, the following conditions must serve for the selection of materials:

1. In the problematic teaching of physics, the material should not only give information about the essence of the subject, but also express the exact characteristics of the subject.

2. In the problematic teaching of physics, the material chosen should not only serve as a visual medium, but also as a methodological aid in the deepening of theoretical knowledge for the teacher. 3. In the problematic teaching of physics, it is necessary that the material chosen will enable the students to understand the scientific problems and help them to learn, to form interest. 4. The study of materials on the problematic teaching of physics should have a specific feature for each subject. 5. In the problematic teaching of physics, materials must express the prospects for the development of modern science techniques. 6. Before the problematic study of materials into physics, we found it appropriate to dwell on the concept of "problematic situation".

A problematic situation is an objective contradiction that requires active thinking from the student. The problematic situation, combined with the need for students to assimilate new material, forces them to return to previously studied material [6, 7]. The selection of material in problem-based learning must meet the following requirements of students:

1. Choose when a student encounters a problem situation in the process of studying the material, let him count on its solution in combination with a feeling of a certain difficulty. 2. The selected material should cover information that is new to the reader. Let this, in turn; arouse the reader's interest in research. 3. When

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preparing material on physics of problematic content, it is necessary to take into account the purpose of training.

If a student in the process of obtaining knowledge in physics can independently assimilate the material, he can get independent knowledge [8].

Independent acquisition of knowledge means, firstly, the ability to analyze the studied material yourself; secondly, the ability to look for ways to solve problems on the studied material [10, 14].

In our opinion, one of the difficulties of organizing problem-based learning is the teacher's ability to correctly select materials during the lesson. Questions on the selected material should be constructed in such a way that the reader fully assimilates the material in the process of answering the questions.

The pedagogical skill of a student consists in the ability to see a problematic situation according to the selected material and be able to correctly put it in front of students. To do this, the teacher must, first, deeply and thoroughly study the material being studied.

In problem-based learning, the teacher can choose the material based on its nature, dividing it into the following levels:

1. In problem-based learning, the problem in the selected material is determined by the teacher himself. During the explanation of the selected material, the teacher solves the problem. The educator will be active in this. 2. In problem-based learning, the problem in the selected material is determined by the teacher, to the solution of which the student is mainly involved. This is more convenient when presenting new material. At the same time, the student's activity increases while maintaining the teacher's activity. 3. In problem-based learning, the problem on the selected material is determined by the teacher and solved by the student independently. At the same time, the student's activity increases, and the teacher only helps to analyze the problem. 4. In problem-based learning, the problem contained in the selected material is determined by the student himself, who is looking for his solution. This means that the reader is given complete freedom [11].

Based on the conducted pedagogical experimental and verification work, we determined the essence of the use of problem-based physics teaching. It consists of, i.e., on the basis of materials of problematic content, in order to make it easy to select materials in problem-based teaching topics in physics, we have summarized the data obtained and the material studied in the following direction:

1. Problem study of the material on the history of physics.
2. Problem study of the application of physics in practice.
3. Problem-based study of physics assignments.

All the accumulated material of problematic content was selected, brought into an integrated system, taking into account the tasks set above and the forms of education and upbringing, the principles of didactics in teaching physics.

If the volume of material in problem-based physics teaching is large, then those that can fully meet the requirements of the school curriculum of general secondary education are selected among them. Considering this requirement, the material of the selected problem content should not distract the reader from the main material, but contribute to the consolidation and deepening of the topic under study, increase interest in acquiring knowledge, and reveal the connection of physics with practice.

The content of the chosen problem should arouse the reader's interest in the material being studied; contribute to an in-depth study of the program material.

Problem-based teaching of physics can be successfully used when the task is able to directly introduce students to the basics of new modern technology and technology in a sufficiently scientific aspect, to develop their interest in solving the task. This is one of the important selection criteria arising from the modern requirements for the content of the school course of general secondary education. The use of materials of such content in teaching physics is characterized by:

1. Allows you to determine the place of physics in modern production. 2. Equips students with the necessary knowledge so that in the future they can specialize in the field of energy and conduct research and development.

One of the criteria for selecting material in problem-based physics teaching is the level of general development of the student, the possibility of mastering it. Also, so as not to create overload for the reader.

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The selected material in physics is important for the implementation of polytechnic education. In case of problematic teaching of physics, it is necessary to select such materials that, in turn, could closely help in the study of the physical foundations of the electrification of the national economy, the use of computer technology and technology [13].

In the problem-based teaching of physics, we mostly used the following principles of didactics.

1. In case of problematic teaching of physics, the selected material should first be harmoniously connected with the study of the issues contained in the program, allow performing educational and educational tasks facing the physics course of a secondary school. 2. In problem-based teaching of physics, the principle of the connection of the task with practice, or rather, with life, is laid down. 3. The chosen problem contributes to the implementation of economic and polytechnic education. 4. The material chosen for problem-based teaching of physics should be scientifically convincing and correspond to the pedagogical goal. It can be used in problem-based teaching of physics only if the tasks set give a clear idea of the practical need for the student. To do this, the problem posed must be more thoughtful, convincing than the object. 5. In case of problematic teaching of physics, the selected material should take into account the age characteristics and theoretical readiness of the student. The content, volume, place of the material investigating the problem are determined based on the overall development of the student. 6. The selected material for problem-based teaching of physics is the basis for independent and research activities of the student [12].

The problematic material being studied should not stand out from the program material, but harmoniously fit into it. The selected material should be given with examples and proofs so as not to overload students with problematic teaching of physics. There should be no unnecessary details in the problem under consideration.

The materials selected for problematic teaching of physics in lessons and extracurricular activities, as well as for solving problems and performing laboratory work, should be scientifically sound, appropriate from a pedagogical point of view. In addition, in the learning process, it is necessary to use such principles of didactics as consistency, consistency, visibility.

Problem-based learning in teaching the section “physics”, as well as teaching other sections of physics in secondary schools, increases the effectiveness of the educational process and the student's activity and interest in the subject. If in the course of the lesson it is appropriate to use questions, questions, tasks of problematic content, then undoubtedly arouse the student's interest in the discovery of scientific novelty. The student independently searches for the answer to the task, tries to solve difficulties in solving the task. The use of tasks, tasks, and issues of problematic content in physics lessons leads to an understanding of the essence of physical processes.

In the physics section “physics”, where we conduct research, the selection and solution of problems of problematic content is of particular importance. By selecting and solving problems of problematic content in physics, the student's thinking ability increases, promotes deep assimilation and consolidation of the topics covered.

In the research work of many Methodist - physical scientists, great attention has been paid to the use of issues with problematic content in the course of the lesson. For Example: L.I.Reznikov, V.G.Razumovskiy, and R.I.Malafeev. It is proved that have a good result in their research work. R.I.Malafeev said that problematic issues from physics are directly related to issues of a creative type.

What should be understood when talking about problematic issues? In our opinion, problematic issues should meet certain requirements. One aspect of the legislation to choose and solve the problem will not be opened. Such a failure in the matter makes it a direct problemtiradi. Only the issues in this direction help the student to gain in-depth knowledge, to grow his thinking abilities.

Conducted pedagogical experience-test works confirm these conclusions. Pedagogical experience-during the test work, knowledge of students of VIII class is checked after the review of such subjects as “strength of the vine”, “tension”, “and resistance of the conductor”. After the students have mastered the above topics well, they are given questions of problematic content, which should be approached creatively.

In physics lessons, independent laboratory work of students, demonstration experiments, frontal laboratory and practical work were carried out.

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Problematic laboratory work from physics is one of the main techniques in teaching the student to connect with practice. In our own research work, we used the problematic teaching method in carrying out problematic laboratory work in the lessons on Physics.

It is known that laboratory work, which is performed by means of clear instructions from physics, leaves little opportunity for the reader to operate independently. At the same time, in such laboratory work, all readers are in the same situation, and their individual possibilities are not taken into account. The teacher faces many difficulties in assessing the student. At some time, the teacher evaluates the student depending on the laboratory work performed. If a student solves a problem by himself through experience, it becomes easier for the teacher to evaluate.

We offer the student a problematic laboratory work with varying degrees of difficulty from physics. At some times, the pupil is assigned one general and several auxiliary tasks.

The help that the teacher gives to the student should have an individual description. In assessing the student, first, it is taken into account the fact that he independently performs problematic laboratory work and the volume of work.

Problematic laboratory work from physics in general can be organized as follows:

- To seek out the general idea of performing problematic laboratory work from physics;
- drawing up a plan to create a problematic situation;
- creating a problematic situation;
- solving a problematic situation;
- processing the results obtained using mathematical-statistical techniques;
- draw scientific conclusions, make practical recommendations.

For example, let us look at the example of the topic “determination of the electrical conductive strength and internal resistance of a current source”.

Laboratory work from physics is revealed in the textbook in such a way that the student does not need to think independently.

Before the start of work, the following necessary equipment is placed on the reader's desk: batteries, razor rheostat, ammeter, voltmeter, and switch. On the blackboard is written the subject of the laboratory work. “Determining the internal resistance of the battery”. On paper, in large letters, the following two additional tasks are written, which are hung next to the whiteboard:

1. If the outer resistance of the conductor is equal to R, What is the current strength I in the chain: check the result obtained in the experiment? If the result obtained does not correspond to the experience, then explain its cause.
2. How do you determine the internal resistance of the source, if there is only an ammeter and a rheostat at your disposal? Does internal resistance correspond to the first experience? If it does not fit, explain its cause.

The teacher informs that when the first laboratory work is done, the “three” evaluation, when the first and second work is done, the “four” evaluation, when all the work is done, put the “five” evaluation. It is worth noting that the evaluation of the work depends on its independent implementation. If the reader asks for help or looks at the reader sitting at another party, the price will be reduced. After that, the teacher writes the following:

1. Drawing up a written plan for the performance of the laboratory work.
2. Draw an electric chain scheme and draw it.

If among the students there is a problem from physics that the laboratory cannot perform, then he will be given a card that will help him to do the work. In the evaluation of this work, of course, it is taken into account. It can be in the following content:

1. For a full chain, write the formula of the Om law.
2. Remember how to determine the electric driving force of the source.
3. Once again, remember the way to determine the internal resistance.

The remaining aids are given individually and orally. After the plan of the work is checked by the teacher, the connecting wires are given to the students.

When can a problematic laboratory work from physics be problematic? If the job assignment has a problematic description, then the problematic assignment can be associated with a non-problematic assignment.

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The first additional assignment in the work under consideration is not problematic, since it is not intended for the independent performance of the student, that is, it does not require new methods of performance. These assignments have a description of the exercise-check. The second additional task requires a new method of solving.

Physics can be used when performing problematic laboratory work, depending on their characteristics, training time and taking into account other circumstances. In some cases, it can only be used to reveal the idea of the head of the case by putting a problem. In most cases, it is not possible to let go of the case completely without problems. For example, “determine the electrochemical equivalent of copper”. In carrying out problematic laboratory work with such content, the reader cannot see the important aspects of the work. The reader should know that during electrolysis there is a constant decrease in the power of the current and it is necessary to add a chain re rheostat to keep it the same, the copper layer in the cathode is strong only at a certain density of the current, it is necessary to have enough time to perform the experiment.

Therefore, it is desirable that the laboratory work on such content was carried out according to the instruction. However, to determine the general idea and important characteristics of the work, it is possible to give the reader problematic assignments. For example, look for an experimental method of determining the electrochemical equivalent of copper. Make a plan for the execution of the work. Such assignments can be given as a homework at the end of the lesson before the problematic laboratory lesson. Readers come to write their thoughts on the sheet.

At the beginning of the problematic laboratory lesson from physics, the sheets are collected and together with the class, the ideas that were put forward are discussed. At the same time, attention is paid to the correct performance and result of the problematic laboratory work from physics. In practice, we were so convinced that the organization of work from physics in the form of a problematic laboratory would help the student to understand the idea of experimentation and learn its important aspects.

Pedagogical experience-test work shows that problematic laboratory work from physics is more effective if it is carried out in conjunction with laboratory work performed by the instruction. Because not every work can be organized in the form of a problematic laboratory, which, if possible, is also not desirable.

It is not advisable to organize laboratory work from physics in a problematic way in the following cases:

1. When the idea of the research work is difficult for the reader to find independently. For example, a laboratory work on the content of” determine the electrochemical equivalent of copper". 2. Important aspects of the laboratory work are at a time when students do not understand it independently. 3. When the purpose of a problem laboratory work from physics coincides with the formation of elementary practical skills and skills in the student or observation of the phenomenon. 4. When the theoretical knowledge necessary to perform a problematic laboratory work from physics is not sufficiently mastered.

At other times, it is worth considering that problematic laboratory work from physics is suitable for most students in the class. If you are sure, that is, most students in the class cannot independently perform at least some part of the work, it is not worthwhile to conduct a problematic laboratory work from physics.

CONCLUSIONS

1. For the good assimilation of the student in the problematic teaching process of physics, theoretical knowledge, practical skills and qualifications were formed in it.

2. The absence of a problematic system of teaching physics in secondary schools in general prevented the student from gaining independent knowledge, creative study of materials on the subjects.

3. At present, the level of problematic teaching of physics in secondary schools in general is low, this problem is theoretically and practically not sufficiently worked out, and there are practically no methodical manuals for the teacher, teaching aids for the pupils.

4. It is worthwhile and important to use problematic teaching of physics in class, extracurricular and elective classes. Because in the context of the scientific worldview of students, the material on physics made it, possible to apply the theoretical knowledge gained in the lessons in practice.

5. The course work on the problematic teaching of physics by the researcher created the conditions for increasing the effectiveness of the use in teaching and learning outside the classroom, thus enabling the students to develop their positive abilities.

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