FACTORS FOR IMPROVING PROBLEM SOLVING METHODS IN TEACHING PHYSICS

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Annotation. When teaching physics, teachers often use the traditional method of solving physics problems in practical classes. When solving physical problems, it is important not only to know the essence of physical phenomena, but also to be able to analyze the content of this problem and the result obtained. This paper presents the stages of the problem solving process.

Key words: teaching technologies, physical phenomena, problem solving process, physical, mathematical and analytical stages, traditional method, generalized method.

Today, higher education institutions face the task of modernizing education and science. Changes in higher education should be aimed at forming a certain amount of knowledge, skills and competencies necessary for further self-realization in the student. Currently, as the amount of information needed in the educational process is constantly increasing, the issue of improving and creating existing teaching technologies and improving the educational process remains urgent.

To raise the education system in higher education institutions to the level of international requirements and to solve issues aimed at training educated, inquisitive, scientific potential personnel, it will be necessary to create educational and methodological support using mainly international experiences. As a result of the analysis of the content of the available scientific and educational literature (programs, instructions, manuals, textbooks, relevant guidelines, etc.), the methods of solving and constructing physical problems meet the criteria of the subject content, but methodological part is structured in the form of general instructions, which makes it difficult for students to work independently. This leads to the need to review teaching methods from the point of view of generalization and systematization of the field.

In the teaching of physics, engineers must observe, understand and explain physical processes and phenomena, know physical quantities, measure and draw conclusions, be able to use physical knowledge and tools in practice, create new ideas and actively communicate in scientific, industrial and general events. , forming the ability to solve problems and find new solutions is defined as the main tasks. In order to solve this problem, in our opinion, the main attention should be focused on students being able to solve problems independently in practical training classes.

In order for students to be able to independently solve problems in the general physics course, it is necessary to carry out additional research on this problem. In this, it is necessary to pay attention to the improvement of the educational process, the formation of cognitive activity, and the improvement of the quality of students' knowledge.

Many students, even those with good theoretical preparation, have difficulty solving problems in physics. In practical training, the teacher mainly uses the traditional method for solving problems: the teacher explains the general principles of solving problems on a given topic with the example of solving one or two concrete problems, and then solves the problem in a group manner, students mainly copy from the board , in which they will not have the opportunity to analyze and draw conclusions. In the process of solving physical problems, in most cases, it is based on the principle of "from particular to general", where students do not have the opportunity to independently choose the methods and ways of solving a particular physical problem. Usually, the following methods are used to solve physical problems: passive, active and independent. Basically, in the passive method, in the process of solving problems, the teacher shows how to solve 1-2 problems, and then the students solve the problems as a team. In this way, the participation of students in solving the problem is less. In an active way, students solve the problems set before them as a team. In this method, students actively participate in the process. In the independent solution method, the student solves physical problems independently.

In our opinion, if the principle of "from generality to particularity" is used in solving problems, the ability of students to solve physical problems in a general way is achieved. The "general to specific" problem solving method cannot be used to solve all problems. It is appropriate to use this method in solving the problems of a certain group. The induction method is more suitable for students who are just getting acquainted with the theoretical material and acquiring the necessary practical skills.

It is appropriate for students to familiarize themselves with the methods of solving certain types of problems, master them, and then use the generalized method in solving certain types of problems in cooperation with the teacher. In this generalized method, students should have a deeper understanding of the essence of the process that is carried out at each stage in the process of solving problems. For this, it is necessary to create an algorithm from the methodical and analytical aspect of organizing a generalized method of solving certain types of problems.

In solving physical problems, it is important not only to know the essence of physical phenomena, but also to be able to analyze the content of this problem and the obtained result. The process of solving problems is carried out in 3 stages: physical, mathematical and analytical. At the physical stage, familiarization with the condition of the problem, the analysis of physical processes and comparison of necessary laws and equations, at the mathematical stage, in general, solving the problem by forming equations related to the physical process and numerical calculations, and at the analytical stage, the correspondence of the answers to the conditions of the problems, the correspondence of the obtained numerical values to the values of physical quantities analysis of the size of the arrival and the obtained result is carried out. A specific method of solution is chosen when performing a sequence of steps in solving problems.

The physical stage process can be divided into introductory and main parts. Familiarity with the condition of the problem in the introduction: understanding the content of the problem and expressing the condition of the problem in a picture. In the main part, qualitative and quantitative analysis is carried out. In the qualitative analysis, the physical processes in the problem, and in the quantitative analysis, the laws and equations related to the physical processes in the problem are determined.

The mathematical stage is divided into 3 parts: in the first part, the general equations related to the physical processes in the problem are presented and simplified according to the condition of the problem. In the second part, the expression for calculating the physical quantity under the conditions of the problem is derived using equations. In the next part, the unit of physical quantities is expressed in the SI system and calculations are made using the derived expression.

The analytical stage can be divided into 2 parts: analysis of physical quantities and physical phenomena. In the analysis of physical quantities, the value of the determined physical quantity corresponds to the actual value and the analysis of their dependence on the values of the physical quantities in the conditions of the problem is carried out. In the analysis of physical phenomena, the physical phenomena presented in the problem are analyzed on the basis of phenomena corresponding to other cases. In this way, students will be able to develop the skills of deeper analysis of physical phenomena.

Let's consider the implementation of the sequence of steps in solving problems through the following problem:

The problem. The cyclist went from one city to another. He covered half of the road at a speed of 24 km/h. he walked at a speed of 12 km/h during the first half of the remaining movement time and at a speed of 6 km/h until the end of the second half. Find the cyclist's average speed over the entire journey.

Provided by: $\upsilon_1 = 24$ km/h,

$\upsilon_2 = 12$ km/h,

$\upsilon_3 = 6$ km/h.

Must find: $\bar{\vartheta} = ?$

Solution: a) the physical stage. We divide the entire path traveled by a cyclist from one city to another into sections S_1, S_2, S_3 and set the speeds in each of them as υ_1, υ_2, υ_3 and set the travel times as t_1, t_2, t_3. The average speed of the cyclist during the whole journey is equal:

$$\bar{\vartheta} = \frac{s}{t}$$

The total distance covered by the cyclist and the time taken for the entire distance covered

$$s = s_1 + s_2 + s_3$$

$$t = t_1 + t_2 + t_3$$

from the equation, we get the following for the average speed along the whole path:

$$\bar{\vartheta} = \frac{s}{t} = \frac{s_1 + s_2 + s_3}{t_1 + t_2 + t_3}$$

The paths taken for each part of the movement:

$$s_1 = \vartheta_1 t_1$$

$$s_2 = \vartheta_2 t_2$$

$$s_3 = \vartheta_3 t_3$$

will be equal to According to the condition of the problem, the relationship between the paths traveled and the times will be as follows:

$$s_1 = s_2 + s_3$$

$$t_2 = t_3$$

b) mathematical stage. We solve for $\bar{\vartheta}$ from the above expressions and get the following:

$$\bar{\vartheta} = \frac{s_1 + s_1}{t_1 + 2t_2} = \frac{2s_1}{\frac{s_1}{\vartheta_1} + \frac{2s_1}{\vartheta_2 + \vartheta_3}} = \frac{2\vartheta_1(\vartheta_2 + \vartheta_3)}{2\vartheta_1 + \vartheta_2 + \vartheta_3}$$

Let's calculate the given values of speeds,

$$\bar{\vartheta} == \frac{2\vartheta_1(\vartheta_2 + \vartheta_3)}{2\vartheta_1 + \vartheta_2 + \vartheta_3} = \frac{2 \cdot 24 \cdot (12 + 6)}{2 \cdot 24 + 12 + 6} = 13{,}09 km/h$$

Javob: *$\bar{\vartheta}$=13,09 km/h.*

c) analytical stage. If, in the conditions of the problem, the speeds on the sections of the road S_1, S_2, S_3 were given separately as υ_1, υ_2, υ_3, then the average speed of the cyclist along the entire road

$$\bar{\vartheta} = \frac{s_1 + s_2 + s_3}{t_1 + t_2 + t_3} = \frac{s_1 + s_2 + s_3}{\frac{s_1}{\vartheta_1} + \frac{s_2}{\vartheta_2} + \frac{s_3}{\vartheta_3}}$$

It would be in sight. If S_1=S_2=S_3, then

$$\bar{\vartheta} = \frac{s}{\frac{s}{3}\left(\frac{1}{\vartheta_1} + \frac{1}{\vartheta_2} + \frac{1}{\vartheta_3}\right)} = \frac{3\vartheta_1\vartheta_2\vartheta_3}{\vartheta_1 + \vartheta_2 + \vartheta_3}$$

would be equal.

If in the condition of the problem, the speeds of the movement times t_1, t_2, t_3 were given individually as υ_1, υ_2, υ_3, then the average speed of the cyclist along the entire path

$$\bar{\vartheta} = \frac{s}{t} = \frac{\vartheta_1 t_1 + \vartheta_2 t_2 + \vartheta_3 t_3}{t_1 + t_2 + t_3}$$

will be equal. If

$$t_1 = t_2 = t_3$$

equal, then the average speed of the cyclist along the entire route

$$\bar{\vartheta} = \frac{\vartheta_1 + \vartheta_2 + \vartheta_3}{3}$$

would be equal.

It should be noted that there is no universal way of solving problems. By developing generalized methods for different classes of problems from existing methods, it helps to better understand the studied material in the problem, and the skills of setting problems independently are formed.

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