

FORMATION OF PHYSICAL THINKING IN STUDENTS IN THE PROCESS OF PROBLEM SOLVING

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Abstract

In this paper we consider the important and modern methods of problem solving in physics teaching, namely, developing the form of physical thinking of students. Given the importance of problem solving in the study of physics, most students support the idea that the more problems, and especially difficult ones, are solved, the better. However, this puts a strain on the students, as a result of which they lose confidence in their abilities and the students lose interest in science. Therefore, today it is necessary to take a serious approach to the methodology of solving problems in physics.

Keywords: Modern methods, physics teaching, students, Student Assessment Program, physical quantities.

Introduction

In his address to the Oliy Majlis, President Shavkat Mirziyoyev said, "... If we look at history, we see that physics is the fundamental basis for the creation of almost all discoveries and technologies in the world. Without a deep understanding of the laws of physics, results cannot be achieved in today's demanding fields such as engineering, electrical engineering, IT, water and energy-saving technologies " [1]. President Shavkat Mirziyoyev has declared 2021 the Year of Physics and English Language in the Republic, which in turn indicates the strengthening of education in our country.

In this regard, due to the increase in the scientific and theoretical level of high school physics, more and more attention is paid to solving problems in physics. It is not possible to take a physics course without solving problems in physics. Many schools place great emphasis on solving physics-related problems. However, many students have difficulty solving problems, which is evident in the final exams and entrance exams. In order to prevent problems and shortcomings, the school understands that special attention should be paid to the methodology of selection and solution of problems in the physics course. Instead of forcing the child to memorize, they should be helped to understand. A conscious approach to science is more effective than winning: the child dies, understands the problem, and puts his or her knowledge into practice.

Given the importance of problem solving in the study of physics, most students support the idea that the more problems, and especially difficult ones, are solved, the better. However, this puts a strain on the students, as a result of which they lose confidence in their abilities and the students lose interest in science. Therefore, today it is necessary to take a serious approach to the methodology of solving problems in physics. Because by 2030, we need to step up strong reforms in all areas to make the Republic of Uzbekistan one of the top 30 developed countries in the world in the ranking of the PISA International Student Assessment Program.

BASIC RESULTS

This article aims to acquaint the teacher with the most important and modern methods of problem solving, which shape the physical thinking of students, give them relevant practical teaching skills.

Solving problems in physics is a means of strengthening the theoretical knowledge acquired by students, the formation of skills and abilities to apply it in practice. Problem or exercise solving is done after theoretical training. Problem solving is an integral part of the physics teaching process and can be conducted both as a separate course and in the process of transitioning to new material. To what extent has this issue been resolved in secondary schools? The answer to this question can be found in the information provided in the DTM newsletter. Based on the results of this information, it is known that the response of entrants to the test tasks in physics is the lowest in the country. This indicates that not enough attention is paid to solving problems in physics in general education schools.

The following didactic objectives are considered by solving problems in physics.

- 1) Problem-solving helps students to master the laws of physics in greater depth and comprehensively.
- 2) Develops skills and competencies in students to apply theoretical knowledge in practice.
- 3) It is an important tool in the implementation of polytechnic education.
- 4) By solving problems in physics, students gain the ability to select the content of formulas.
- 5) Problem solving serves to help students use tables, units of measurement, and the connections between them.
- 6) The connection between physics and biology , mathematics .
- 7) mastering the functional connections between events, students develop a scientific worldview about the universe.
- 8) Educational significance. By solving the problem, students perform pedagogical tasks such as patience, creativity, aesthetics, diligence, patriotism, career choice.

The condition of the matter is read carefully, if the matter is complex, it is read several times.

- 1) Record the physical quantities given in the problem condition in the form of a column to the left.
- 2) Bringing all physical quantities into one system.
- 3) Based on the condition of the problem, derive a formula for the physical quantity sought from the laws that represent the physical phenomenon and the laws that represent the connections between events.
- 4) given values by adding them to the formula .

5) of the unit of measurement of the physical quantity studied on the basis of the formula .

6) Check the solution of the problem.

In the order of solving the above physics problems, the most important thing is to derive the relation that represents the physical quantity sought. Let's take a closer look at this process. So far, several methods have been developed to solve physical problems. Let's get acquainted with the systematic approach to solving the problem . In the systematic approach, each physical process is considered a system. From the elements of the system and the interaction between them, the physical quantity sought is found. The common denominator for all physics problems is that as a result of an interaction with a physical object, it takes on a new state. And the search for a functional connection representing this interaction is a matter of physics main part of the solution .

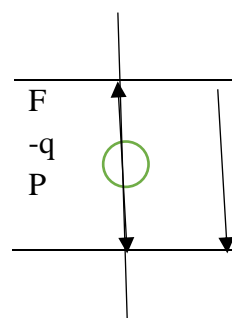
Therefore, in physics lessons, it is advisable to teach students how to solve all types of problems, rather than how to solve some physical problems. To do this, on the basis of a systematic approach to each problem, an equation representing the physical quantity sought through the event and cause connections is given.

To teach students the problem-solving methodology, we will explore the following problem.

Example: A drop of charged oil with a negative sign of mass 10^{-11} kg hangs in a vacuum between horizontally placed metal plates. If the distance between the plates is 4.8 mm and the voltage between the plates is 1 kV, determine the charge of the oil drop?

Given: Solution + +

$m = 10^{-11} \text{ kg}$	condition of issue
$r = 4.8 \text{ mm} = 4.8 \cdot 10^{-3} \text{ m}$	compatible drawing
$U = 1 \text{ kV} = 10^3 \text{ V}$	we draw



$$q = ?$$

$$P = mg \quad (1)$$

$$F = qE \quad (2)$$

The first object in this regard:

- 1) A drop of oil with a negative sign charged mass 10^{-11} kg.
- 2) Second object: Metal plates with a voltage of 1 kV located in a vacuum at a distance of 4.8 mm from each other and the electric field between them.
- 3) is the vacuum between the plates .
- 4) a negatively charged mass of 10^{-11} kg is suspended.

oil is affected by 2 forces ; the first is the force of gravity $P = mg$, the second is the force exerted by the electric field

$$F = qE .$$

According to the condition of the matter, these two forces are equal and directed in opposite directions, they compensate for each other, so that the oil is suspended. Since formulas (1) and (2) are equal, we write in the ring.

$$q E = mg, \quad (3)$$

hence

$$q = mg / E = mg / U, \quad (4)$$

that is

$$E = U / d$$

If we put the values in formula (4), the amount of charge of a drop of oil is determined.

Answer : $4.8 \times 10^{-13} \text{ Cu}$.

A method of developing skills and competencies in students in a problem-solving lesson.

Detailed information on skills and competencies in pedagogy and didactics is provided. Ability is the ability of a student to solve a problem. Skills are accumulated and skills are acquired. A qualified student solves the problem quickly and correctly. Most of our young people graduating from secondary school have the skills to solve problems, but the skills are not formed. A systematic approach to solving this problem is needed. If we consider the learning process as a system, its elements; student, teacher, educational literature, cultural environment, and so on. These elements, in turn, are a system. For example, if we take the student as a complex system. Its elements; the student's consciousness, talent, curiosity, patience, diligence, purpose of learning, and so on. The qualification of students depends not only on their personal qualities, but also on the qualifications, experience and teaching methods of the physics teacher. The expected result can only be achieved if the interaction between the student and the teacher has an open democratic basis.

Problems in physics can be solved in the classroom and at home. In class, we will talk about how to solve a problem. At the beginning of the lesson, the teacher writes the problem condition on the board and shows one or two problems as an example. Invites students to solve the next problem. The teacher walks around the classroom, observing the students' actions. Helps students who are failing or making mistakes. Encourages them. Encourages students who are doing well to solve the next problem. It is also possible to ask one of the students to solve the problem on the board. In this way, students acquire skills and competencies such as independent thinking and reasoning. When advising students to solve a problem independently, there should be some silence, that is, students should try to solve the problem independently. Then help if necessary.

Problem solving should also be recommended at home. Homework assignments should be appropriate to the students' level of knowledge, otherwise they will not be able to do their homework. Similarly, the number of issues should not be excessive. Because students also have time to do homework in other subjects. Homework assignments should be checked in the next lesson, otherwise students will be reluctant to solve problems at home. The homework assigned must be evaluated.

Methods of solving quality problems

Quality issues are given to reinforce the topics studied. There are also sections of physics in which quality issues play a central role. Quantitative issues are not solved. One such

department is Hydrodynamics. Quality issues are also important when asking for a topic. These types of issues allow us to understand the physical nature of the issue at hand in a short period of time, whereas other types of issues are less effective in this area. There are several types of quality issues. In solving qualitative problems, it is usually necessary to be able to draw logical conclusions based on the laws of physics using induction and deduction .

Procedure for solving quality issues

- Read the condition of the problem, identify all the terms in the condition of the problem.
- Analyze the condition of the problem, identify physical phenomena, and draw a diagram or diagram if necessary.
- Creating a chain of analytical and synthetic feedback.
- Analyze the result according to its physical meaning, to determine whether it corresponds to the condition and reality of the problem.

Then we describe the methods of solving quality problems and divide them into two main groups:

- Soda issues related to quality or they are sometimes called issues. They are usually solved according to a single physical law, and it is easy to draw a number of logical conclusions.
- Complex issues of quality that combine several simple issues. In solving them, it is necessary to draw a number of much longer logical conclusions, to analyze several physical laws.

Methods of solving creative problems in physics

It is agreed that problems for which the solution algorithm is unknown are called “creative problems”. The conditions of such matters are masked ; data is lacking, data is redundant, or physical data from the field needed to solve the problem is not provided at all.

In solving creative problems in physics, the first step is to explain the phenomenon, that is, to answer the question of why. In the second stage, it is necessary to answer the question of how to implement real events that meet the requirements. This means that according to the task method, creative issues are divided into exploratory (why?) And constructive (how to do it?).

A) Issues based on the explanation of any technical phenomena or the obtaining of any technical effect.

B) Issues that require explanation or the use of some natural phenomenon.

C) Issues that require an explanation of the principle of operation of a particular tool or the creation of a new tool design.

D) Issues that require the explanation of a laboratory event, the construction of an event module that satisfies the conditions, or the discovery of a new event.

In the process of solving creative problems, students develop their creative abilities. One of the factors determining the strength of our independent state is the growth and development of educated, highly talented, creatively active personnel. Therefore, it is expedient to solve problems of a creative type in physics lessons in various educational institutions of the Republic. According to President Decree 5032, only about 5% of students studying in physics-intensive secondary schools are covered. However, there are also graduates of secondary schools who want to study at universities of technical education, who must also correctly determine the solution of problems in the test blocks in physics in the entrance exams to the university. However, when solving problems on the basis of the curriculum of secondary

schools, students only develop the ability to solve problems, it is necessary to organize extracurricular activities to develop in them the skills of problem solving. These classes are conducted in extracurricular physics clubs, conversations, or in the course of lessons agreed upon between the teacher and the student. [2]

Encouraging students to solve physical problems and their methods.

Problem -solving methods depend on the simplicity or complexity of the problems, the goal set by the teacher, the level of knowledge of the students, and many other reasons. Problem-solving methods according to the mathematical apparatus used in solving them; divided into arithmetic method, algebraic method, geometric method, graphical methods.

Depending on the nature of the logical operations used in the problem-solving process are divided into analytical, synthetic or analytical-synthetic methods. The use of these methods in problem-solving textbooks in physics, we have in our department many textbooks on problem-solving technology in physics and astronomy (educational-methodical complex) and problem-solving in physics. The textbooks [3-7] provide a detailed description, and even many problems are divided into adjectives, but due to the limited time to deliver information to students in the physics problem-solving class. The teacher will help students to work on complex, experimental, graphic, qualitative, creative issues in the physics class on specific days of the week outside of class, as well as with the help of the teacher during additional classes. It is now a tradition to conduct this course in consultation with the tutor-teacher, especially for applicants seeking to transfer to higher education. Tutoring is organized not only in physics, but in all disciplines in the training centers.

CONCLUSION

In conclusion, it is necessary to follow the tutor-teacher in order to achieve the skills from the ability to solve problems in physics. If the student aims to independently solve problem-solving skills, the complex, which is available on the site of the department, which we recommend above, will also achieve its goal if he masters the problem-solving textbooks in physics.

REFERENCES

- 1) Mirziyoev SH.M. Address of the President to the people of Uzbekistan and the Oliy Majlis on his website president.uz, fb.com/
- 2) Mirziyoev SH.M. PQ-5032 No. 19.03.2021.
- 3) Educational methodical complex of the technology of solving problems from physics and astronomy.Ziyonet.uz
- 4) G ' aniev AG. Solving set in physics and astronomy. Physics 1,2,3 part Tashkent 2018-part.
- 5) Rizaev T. Nurillaev B. Methods of solving problems in physics on the website of TDPU 2005.
- 6) Olmasova et al. "Fizira" T "Teacher" 1995y.
- 7) Kamenskiy SE Orekhov VP Methods of solving physical tasks. M. Prosveshenie 1993g.



Websites

1. www.pedagogue.uz
2. <http://www.ziyonet.uz>

