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THE EFFECT OF USING INTERACTIVE METHODS IN TEACHING PHYSICS

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ABSTRACT

The purpose of teaching using interactive methods in teaching physics is to form the knowledge, skills and abilities of students by deeply preparing them for mental knowledge by increasing their mental performance by creating problem situations. The article presents the results of using the problem-based method of teaching physics for independent thinking of students, finding solutions to problem issues through logical, rapid and theoretical in-depth thinking. When teaching physics in general education schools, creating problematic situations when performing laboratory work and solving issues related to the educational topic, students knowledge is consolidated, and skills in the practical application of laws are formed.

KEYWORDS: *Interactive Method, Problem-Based Learning, Creativity, Independent Thinking, Logical, Operational, Psychological State, Problem Situation, Innovative, Creative, Theoretical.*

INTRODUCTION

Methods of activity aimed at achieving learning goals, used in the joint and interrelated work of the teacher and students, are called teaching methods.

In physics lessons, teaching methods are used in various forms: story, explanation, vocabulary, demonstration, problem solving, independent work of students with a textbook, the use of movies and TV shows, student questionnaires, written test papers, etc. M. N. Skatkinand I. Ya. Lerner divides all teaching methods into five groups (according to the nature of cognitive activity): descriptive (illustrative) method of explanation, reproductive (reproducing memorized) method, method of problem presentation, question-and-answer (heuristic) method and research method. Baban sky divides all teaching methods into three groups:

- Methods of organizing and implementing educational and cognitive activities;

- Methods of stimulating and motivating educational and cognitive activity;

- Methods of monitoring the effectiveness of educational cognitive activity.

When grouping teaching methods in the practice of teaching physics, we proceed from the following three characteristics: 1) the source from which students receive knowledge, 2) the nature of the teacher’s activities, 3) the nature of the student's activities.

All teaching methods based on these characteristics are divided into three large groups: verbal, visual and practical methods.

In the verbal method, the teacher gives knowledge to the students, mainly through experience and demonstration through the word. This method includes a story, a lecture, an explanation, a conversation, a TV game, a telemause, and working with a book. In the verbal method, the main source of knowledge is the word[3].

In the visual method, the main thing is that the teacher shows phenomena and objects. Here the word takes on a different meaning. With the help of the word, the teacher correctly directs the logical thinking and observations of students, interprets individual aspects of phenomena. The visual method includes experiments, a diagram, a filmstrip, a drawing, a drawing, and a movie show.

The practical method is laboratory work, physical practice, extracurricular observations and experiments, working with handouts, problem solving, etc. In the process of applying this method, students, along with gaining new knowledge, acquire the skills of experimentation, measurement, search, problem solving and application of theoretical knowledge.

The whole group of methods involves the active participation of students in the lesson process. The use of these techniques serves to develop students ' thinking skills, to educate them in such qualities as curiosity, desire, attention, and hard work.

No method is universal or interesting for solving all learning tasks. The condition for the effectiveness of educational work is the use of various methods in accordance with the purpose of physics lessons, taking into account the age characteristics of students. An oral statement is made in connection with experiments and exhibitions, and the solution of the question is connected with an explanation, drawings and drawings.

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Each one is performed using methodical methods. The methodical method is an integral part of the teaching method, the actions that the teacher and students perform in the learning process separately. For example, laboratory work: l) first the teacher explains, and then the students perform; 2) learn the method of execution from the instructions, and then perform; 3) the teacher sets a task, the students make a plan for its implementation, select tools, then perform the work; the students repeat the theoretical material, make a plan for the work and perform it.

Methodological techniques are divided into three general groups: logical, organizational and technical.

Logical methods consist of identifying various signs of phenomena and objects, comparing their similarities and differences, describing conclusions, generalizations, setting tasks, etc.

With the help of organizational methods, students ' attention is directed to understanding and working. For example: 1. After the ones given on the blackboard are written down, all the students solve the same problem. 2. Students solve various tasks on the cards. 3. Students monitor the results obtained during the exercises using an automatic device.

In the technical method, special handouts are used. For example, with the help of didactic cards, the solution of problems is brought to an individual state; devices for frontal experiments are distributed.

Methods such as methods are also used in combination with each other.

In the learning process, logical thinking techniques are widely used. Methods of logical thinking consist of induction and deduction, abstraction and generalization; analysis and synthesis, analogy(analogy), modeling.

"Inductive inference-inference, as a result of which, based on the knowledge of individual objects of a certain class, general conclusions are formed about the knowledge of all objects of the class.”

Using the inductive method of explanation, the teacher leads students to gain new knowledge based on the display and analysis of the results of the experiment. For example, when explaining the balance condition of the lever, the educator introduces the concept of " force shoulder”, and then shows an experience in which the impact of the load can be balanced by applying various forces to the lever (in this case, a large force will have a small shoulder, and a small force-a large shoulder). Writing down the results of the experiment (forces and their shoulders), the teacher, based on the analysis of experimental data, formulates the condition of the balance of the lever (inductive). As a result of changing the strength and shoulders, again, forming the balance position, it is possible to show the correctness of the above results. The main type of logical inference in theoretical research is deduction. "Deduction is a form of thinking in which a new thought is deduced in a purely logical way (i.e., according to the rule of logic) from some information of judgments”

The teacher uses deduction in physics lessons not only when it is possible to deduce a particular case from general cases (for example, from the main cases of molecular-kinetic theory to deduce its main equation, etc.), but also in all cases when new knowledge is revealed at the theoretical level. Whether the phenomenon or the principle of operation of the device is explained from the point of view of a particular law, whether new connections are created based on the replacement of formulas, whether a theoretical description of new phenomena and patterns is carried out-in all these cases, deductive reasoning is used.

To teach students to analyze the results of experiments and observations, to be able to determine the general and the general, to form on the basis of this inductive generalizations-a necessary condition for the development of their physical thinking.

In the process of studying physics, in order to expand theoretical, abstract thinking, it is important to familiarize students with abstraction, idealization, and analogies.

A simplified study of complex natural phenomena without taking into account the secondary, non-essential properties of the phenomenon is an abstraction. As a result of abstraction, the signs of non-essential aspects and phenomena are simplified. It is considered in its "pure" form. The school studies "straight-line" and" straight-line-accelerated " movement. In nature, the movement of various bodies (cars, planes, ships) can be attributed to one of the actions in an abstract form only with some approximation. All empirically established laws are extraction laws.

In physics lessons, a different kind of abstraction is used in the theoretical disclosure of the material — idealization, that is, a model of a real object. Only imaginary models, not concrete objects, are the objects of theoretical tests. In physics, models of the atom, molecule, atomic nucleus, gas, absolute solid, and chaos are used.

The transfer of a model property to a real object is based on the analogy method. the acquired knowledge about an object (model) is transferred by analogy to another, less studied object. This movement is carried out on the basis of the similarity of the studied objects in their essential features. If the objects studied by analogy are in relations of mutual isomorphism (for example, phenomena are expressed by the same formulas), then the conclusion by analogy becomes not probabilistic, but real.

Oral utterance in physics lessons is carried out in an indissoluble connection with the experiment, the construction and analysis of graphs, tables and figures, the solution of the problem.

A conversation is about bringing new material to the students 'minds through questions and answers based on the students' knowledge and skills.

The conversation plan should reflect, for example,:

1) a group of logically consistent questions corresponding to each stage of the conversation is compiled.;

2) a list of the experiments and exhibitions shown and the place of their display;

3) specify those that are written on the blackboard and in the students ' notebooks.

Through the interview, you can solve the following questions:

- explanation of the laws of physics based on frontal experiments;

- disclosure of the nature of physical phenomena;

- disclosure of the essence of physical concepts based on experiments and exhibitions;

- repetition and replenishment of knowledge;

- determination of ways to solve the problem;

- testing students ' knowledge.

A story is a consistent figurative presentation of the material.

The story method is effective in solving the following tasks:

1) introduce the history of the discovery of various inventions and laws, the life of scientists;

2) introduction to the achievements of science and technology;

3) familiarization of the studied with its application in science and technology;

4) description of phenomena observed in nature and technical devices.

The story should be clear, logically consistent, imaginative, the intensity (pace) is selected depending on the reader's perception and the complexity of the material. The story is supplemented by experiments and exhibitions.

Explanation-consists of a consistent logical presentation of heavy objects through experiments and exhibitions. This method is used when going through these topics that require proof, explanation, and justification.:

1) when teaching the structure and operation of physical devices and machines;

2) when revealing the essence (nature) of phenomena based on theories;

3) in the disclosure of the interrelationships of phenomena;

4) when explaining the properties of bodies on the basis of atomic-molecular and electronic theories;

5) when explaining technological processes based on physical laws.

When the explanation is accompanied by a conversation, the activity of students increases.

Lecture-one of the methods of presentation, which requires from a scientific point of view, a longer time than the story and explanation. This method is more applicable in high school. Because it's basically designed for a full lesson. The lecture requires the student to think abstractly, to be able to listen long and carefully, to be able to take notes, to describe laws and conclusions.

All the techniques of oral narration are supplemented by experiments and exhibitions. The teacher performs the role of both a speaker and a demonstrator of experience in the lesson. Its language should be clear and firm, and its intensity should ensure the reception of students.

In problem-based learning, the physics teacher systematically formulates problem situations when explaining complex concepts and organizes students ' cognitive activity in such a way that they independently analyze facts, observe phenomena, draw conclusions and generalizations, describe concepts and laws, apply their knowledge to new problem situations, solve problems, and perform laboratory work.

Problem-based learning begins with the formation of a problem situation, which activates the students ' thinking abilities. Its next stages are: identifying the problem, identifying ways to solve it, solving the problem, describing and concluding the conclusion[10].

Let the complexity of the problem situation be sufficient for the students to solve it and be able to arouse their interest in overcoming this difficulty. For example, unforeseen problem situations can be formulated as follows: by evaporating the ether in a warm room, we freeze the water (the phenomenon of evaporation), while in a strong storm, the roof of the house separates and rises up (Bernoulli's law). How can this be explained from the point of view of physics?

Problem-based learning can be of several types.

l. The teacher either sets a task and solves it himself, or shows how it is done in science (problem statement).

2. The teacher forms a problem situation, involving students in its solution (heuristic conversation).

3. The teacher describes the problem and recommends its solution to the students themselves (in the form of an experimental task, homework, and observation).

4. The teacher encourages students to set themselves a problem and find ways to solve it.

Now let's look at ways to form problem situations.

Formation of a problem situation by revealing the significance of the studied phenomenon in science, technology and life. Speaking about the technique and the application of the material studied in life in many topics, it is very possible to activate the thinking of students, since physics is the basis of technology. It should also be said that readers can use TV series, popular movies and literature, radio, etc. they get a lot of information from. Therefore, it is necessary to draw the attention of students to it, telling them that the essence of the technology they have heard and other achievements can be learned and revealed through the phenomenon being studied. Let's look at this with an example.

1. Having said that the main question of mechanics is to determine the position of a moving body at an arbitrary moment in time, mechanics solves it, we will focus on the significance of this in technology. Speaking of the fact that the main issue is the need to calculate the trajectories of projectiles, ballistic missiles, unmanned aerial vehicles, satellites, in this method, with great accuracy, the satellites of the Earth fly along accurate trajectories (“Venus”, “Mars”), spaceships are precisely docked to each other and to the stations, we read about how great the value of li is.

2. When studying the electric current in liquids, the importance of solving an important technical issue, i.e., obtaining pure copper and other metals, in coating works is noted.

3. Moving on to the photo effect, television, recording and transmitting sound to tape, the importance of the photo effect in solar panels, it is mentioned that solar panels are installed on Earth satellites, they must be light to provide the device with electricity for 1 year.

4. Lets focus on the value in the operation of engines, accelerators during the passage of Ampere and Lorentz forces.

These methods are of great importance and it makes sense to present them in a narrative style. For example: readers don't know the harm of friction, they don't know the benefit. In the story about its benefits, it is said that a person can not walk on the ground if there is no friction, he can not lift a cotton cloth on conveyors, a violin, make sounds from buzzing, etc.

These methods connect the subjects studied with life, indicate their significance. After passing the topic, the readers ' attention is drawn to it by another emphasis on revealing its essence in technology.

The use of a physical experiment in the formulation of an educational problem. The experiment is a manual of cognition, a method of physical research, a criterion of cognition of the surrounding world. The experiment is also used when setting a learning problem, because it attracts the attention of students. Observation of new unforeseen effects awakens the cognitive activity of students, forms the desire to learn the essence of the phenomenon. Therefore, in some cases, it is suggested to carefully observe the phenomenon, in others-to predict the results of the experiment. Lets look at some examples:

1) Children have seen a lot and know the use of a solid body in water. But those who have not thought about its essence, that is, how to apply it. To arouse interest in the knowledge of the cause of this phenomenon, you can show the following experience. We tilt the glass plate to the spring, touching its lower surface to the surface of the water in the vessel, and invite readers to observe what happens if we continue to lower the water into the vessel. Their attention is directed to the fact that the plate does not come off the water immediately, and the spring is stretched. How to explain it? The initial experience stops here. A problem situation was formed. This situation is analyzed: readers are invited to express their hypotheses in order to understand this situation. They come to the correct conclusion about the nature of the observed phenomenon based on the fact that they know the interaction of molecules from the previous lesson. After that, the subject is given and the experiment continues. We lower the container with water until the glass plate does not come off from the surface of the water. Students see that the detached glass plate is wet, and attach importance to it. Based on this, the issue of wetting will be considered[5,6].

They are wrong when they are asked to predict what the pressure will be if the liquid is poured into containers of different shapes, but with the same height of the faces of the bases, that is, since there is a lot of liquid in a large vessel, its pressure will be large. During the experiment, the pressure will be the same for everyone (even in a small vessel), which they will find inexplicable. A problem situation was formed.

Having shown Oersted's experience in the study of electromagnetic phenomena, we will formulate a problem situation, raising the question of how to explain this behavior of the magnetic needle. Students activate their knowledge of the magnetic effects of current. The teacher solves the problem by introducing the concept of a magnetic field.

Setting a problem with prior experience is also important in high school. For example, by inserting a large one from a small solenoid into it, we will pass a current through them in the same direction. Then, if we change the direction of the current in one, the small solenoid will pop out of the large one, turn (180°), and re-enter the large solenoid. There was a problem situation. Although the knowledge of the magnetic field of the current obtained by students in the lower grades is not enough to explain this, they understand that it is necessary to analyze the situation and study the interaction of magnets in more depth.

After familiarizing students with fluctuations and forced fluctuations, before moving on to autotebrenia, we formulate the problem situation as follows. To the tripod, we hang a stone weighing 1 kg with the help of a spring. Under it, we put on the coil of a universal transformer with a core (220 V). It will be 1-2 cm lower than the stone. Having fixed a steel bar on the second tripod, we touch it to the stone. When we plug the device into an outlet, the stone creates autotebrillity. Its oscillation period is 1,2 s. The light shows (blinks) that the energy is supplied to the oscillatory system. The amplitude of the oscillations depends on the current strength, which is changed by the rheostat. When students are asked what this oscillatory motion is, they cannot compare it with either free oscillatory motion or compulsion. There was a problem situation. Students determine the difference between auto-vibrations and free and involuntary vibrations. This analysis of the problem leads to the introduction of the concept of autotebration and the study of its properties.

A learning problem that is solved by students after several lessons can also be pre-set by an experiment. For example: during the study of the electric field, you can set a task by showing the following experience.

We put two plates vertically, leaving 8-10 cm between them. Between them, we lower the ping-pong ball, suspended on a string. When the plates are charged, the ball is attracted to the nearest plate. If we paint a sphere with graphite (pencils), it will vibrate between the plates. It is solved by conductors and dielectrics after passing their objects in an electric field.

With the help of the experiment, you can give many more examples of setting problems. the statement of the educational problem should be carried out, guided by the psychological laws of the choice of the experiment.

If a new experience is laid in connection with the previous one, the students interest is aroused. Readers are not interested in well-known or incomprehensible experiences. When selective experiences in the lower grades have a strong impact on students and make them extremely agitated, students may not pay attention to them. At this time, it becomes much more difficult to draw their attention to the analysis of the experience. For example: when passing atmospheric pressure, the lesson should not start with the experiment with the Magdeburg hemisphere. It is advisable to show it at the end of the lesson and offer an explanation[3].

Some preliminary experiments arouse only partial interest among readers. For example: the rotation of thunder on a kerosene lamp (before the passage of convection). The electrification of bodies, while Oersteds experiments arouse readers interest in knowing their essence. Also of great importance in increasing the activity of students is the offer to explain the experience during the study of new material or after studying it.

Solving problems in physics is a means of setting an educational task. Drawing readers attention to a new problem and its description can also be achieved by first solving the problem. Let's look at some examples:

When introducing the concept of speed in class 6, it is advisable to consider the following question: Can a car overtake a cyclist if the cyclist has traveled 200 meters in 8 seconds, and the car has traveled 120 meters in 1 minute? Readers will be interested in finding the answer and start searching. They feel that it is possible to find the right answer by comparing speeds, because they know the concept of speed from life and mathematics. By solving this problem, they not only pose the problem, but also begin to study it. Before passing the topic of the capacitor (when passing the capacitance), students are given the task to calculate the capacitance of the globe (as isolated). It is easy to calculate (the electrical capacitance of a spherical conductor is equal to its radius, in CM):

s = 6400 km = 6.4 * 109 cm ≈7.1 * 104 F = 710 UF.

After that, the teacher shows a capacitor with a capacity of 1000 UF and asks: "How can a small body create a capacity equal to the capacity of the globe?"this raises a question. Based on the students ' knowledge that the isolated conducting capacity will be influenced by the surrounding body, the educational task is set: is it possible to form a system of high-capacity conductors that do not depend on the surrounding?

Before proceeding to the dependence of the resistance of the conductor on the temperature, it is proposed to calculate the resistance of the light bulb on the demonstration table. The lamp is designed for 100 W and 220 V, respectively. When calculated using the same data, $R=U^2/\rho$ = 484 ohms. When it is calculated according to the Ohms law (measured by a voltmeter, ammeter) (at a voltage of less than 220 V), the output is 300 ohms, when measured by an ohmmeter in the cold state-35 ohms. How to explain such contradictory answers? There is a problem situation, the analysis of which consists in comparing the measurement conditions. Students find out that the temperature of the lamp fiber is different in each case. Accordingly, the task is set: to determine the nature of the temperature dependence of the resistance and the nature of this phenomenon.

Solving the question concerning the calculation of the cross-section surface of a copper wire, which must be prepared so that during the transmission of electricity (when transmitting over long distances), the losses are minimal, we show that a lot of copper is required (a wire with a cross-section of 2 m), such wires can not be prepared at all, and then we set the problem: how is the transmission of energy through the wires?

Setting a problem by solving it not only increases the interest of students, but also connects their previously acquired knowledge with new ones. Just selecting a question may take some time[11,12].

We can also use questions when posing a problem. They help (encourage) students to increase their cognitive activity. Lets look at some examples.

Before studying the humidity of the air, we put the question:

Why do you have to wipe your glasses when you enter the house from the cold?

Before studying the pressure of liquids and gases, the question arises why is the depth of immersion in submarines limited?These problems are of interest when studying a new topic. Students are encouraged to find answers to the questions posed after studying it. This increases the activity of learning[2].

When a question is used to pose a problem, let them show that their knowledge is not enough. You should not ask a question that the reader can decide on the basis of their previous knowledge. These questions should be more relevant to the students life experience, and also be somewhat difficult to explain. Too complex questions can also dampen the readers interest. the teacher should pay great attention to this.

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