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CREATION OF INNOVATIVE CONDITIONS FOR THE DEVELOPMENT OF LOGICAL THINKING OF EACH FUTURE TEACHER WHEN STUDYING PHYSICS

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Annotation
The article discusses the improvement of the pedagogical aspects of the development of logical thinking of the future teacher based on the methodology for solving different types of problems

Keywords: Logical thinking, future teacher, task, method, hypothesis, technique

Аннотация
В статье рассматривается совершенствование педагогических аспектов развитие логического мышления будущего учителя на основе методика решения разного типа задач

Ключевые слова: Логического мышления, будущей учитель, задача, метод, гипотеза, методика

As we know from many years of experience, problem solving plays a huge role in teaching physics. Problem solving contributes to a deeper and stronger assimilation of physical laws, the development of logical thinking, intelligence, initiative, will and perseverance in achieving the set goal, arouses interest in physics, helps to acquire the skills of independent work and serves as an indispensable tool for developing independence in judgments. Therefore, tasks are the main means of developing the logical thinking of the future physics teacher. The ability to solve problems is a criterion for the success of teaching physics.

Factors related to the task itself and its content

1. Tasks reflecting the history of the development of civilization and the ways of understanding the world by mankind. Historical material showing how the enrichment of logical knowledge proceeded always arouses the interest of the student.

Example: Scientists of antiquity managed to establish that 1) light propagates in a straight line, 2) is reflected from a smooth surface, 3) changes the direction of its propagation when passing from air to water, 4) light beams, interrupting, do not "disturb", i.e. do not distort each other. What experiments can you confirm these discoveries?

This task and similar ones illustrate the role of experiment in the process of cognition: it acts as a criterion of truth. But there can be historical tasks of another type. The main thing is that the following questions should be "sounded" in them: How and under what circumstances was the discovery made? What led the scientist to this? What facts and observations prompted him to decide? What was his original approach to the problem? What hypothesis was he based on? Etc. Such materials reveal the dynamics of cognition (from the simple to the complex, from the particular to the general, from the concrete to the abstract, from one phenomenon to another through their interdependence) and develop the thinking of the future physics teacher.

Qualitative tasks related to demonstration experiments

2.The task is formulated in such a way as to cover as many situations as possible. Why? Experience your assumptions. Draw conclusions. Can such a tube be used as a pipette? Justify the answer [2.24].

Solving a problem, students begin to understand that it is not easy to solve any problem, including an educational one: you need to show persistence and ingenuity, be able to ask yourself questions and answer them, and identify various interrelationships. The words of the famous physicist are becoming clear.

V. Heisenberg: "Often a correctly posed question means more than half the solution to the problem" [1, 18].

In the course of solving them, students get an idea of how this or that quantitative physical regularity is established, how experimental facts can substantiate a theoretical conclusion.

Example 1: Construct a tidy instrument to act as a collecting lens. Create a device from a test tube that would give a reduced image of the object in question. Construct a device out of a tidy that would simultaneously act as both a collecting and a diffusing lens. Think of how to make a device out of a device that will allow you to compare the refractive indices of two substances (relative to air).

Example 2: Develop a plan for a multi-stage experiment to find out the dependence of the electrical resistance of a conductor: what it depends on and how. Run the experiment according to your plan, and then draw a conclusion.4. Задачи, знакомящиеся учащихся с теоретическими методами познания.

These methods include: method of principles, method of hypotheses, method of dimensional analysis, statistical method, method of graphs, etc.

Example 1: (method of principles) What speed in the horizontal direction must be imparted to the body so that it does not change its height above the surface of the Earth in flight? Do not take the surface relief and atmosphere into account; consider the trajectory close to a circle.

Example 2: (Dimensional Analysis Method) Get the formula for calculating the drag force to motion in a fluid.

Example 3: (graph method) For a thermal power plant, it is required to build a cylindrical brick pipe 100m high. There is a brick, the density of which is 1700kg / m3. How strong should this brick be to withstand four times the stress?

Example 4: ("black box" method) Given a "black box" with two leads. Having a battery and an ammeter, determine which electrical circuit is inside it.

To develop a desire to solve problems and activate independence, I suggest that those who wish to choose their own tasks from different problem books and solve them. For each topic, I propose to solve any 15-20 problems in a certain time. I set the deadline for the assignment in such a way that it occurs in 1-2 weeks after the current control of work on this topic.

III. Application of the method "by contradiction".

The activation of the mental activity of students is impossible without their knowledge of certain methods of scientific thinking. One of them is the "by contradiction" method, known by a student from a geometry course.

Example. Can a free electron absorb a photon?

Solution. Suppose a free electron can absorb a photon. Let us write down the laws of conservation of momentum and energy for this case, assuming the interaction to be nonrelativistic. We get y = 2c. After interaction, the electron should have a speed twice the speed of light. This result contradicts SRT. This means that a free electron cannot absorb a photon.

The result of the teacher's work on the development of logical thinking when teaching students to solve problems in physics is the learning outcomes.

They show the level of students' competence, the dynamics of academic performance, cognitive activity, creative initiative, the development of the need for self-education.

Working on the problem of developing a logical style of thinking for students, we became convinced that various methods and techniques of teaching solving problems in physics allow us to better understand the educational problem, to determine the goals of work in the lesson. The presence of a steady interest in the study of physics

for a number of years contributes to the conscious assimilation of physical knowledge, abilities and skills, the development of a scientific style of thinking.

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