PRODUCTIVITY USING VISUAL MODELING IN TEACHING PHYSICS IN THE SCHOOL EDUCATION SYSTEM

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A physical problem in educational practice is usually called a small problem, which is generally solved with the help of logical conclusions, mathematical operations and experiment based on the laws and methods of physics. In essence, in physics classes, every question that arises in connection with the study of educational material is a task for students. Active goal-directed thinking is always problem solving in the broadest sense of the word.

Solving physical problems is one of the most important means of developing the mental and creative abilities of students. Often in the classroom, problem situations are created with the help of tasks, and this activates the mental activity of students.

Using the hydraulic press model, establish a relationship between the change in piston heights and their areas.

Problem solving is an important means of polytechnic education and career guidance for students. The tasks contain important information about many branches of modern production, mass professions, searches and discoveries of innovators and inventors.

Along with tasks of industrial and natural-science content, tasks about physical phenomena in everyday life are of great importance for the connection of learning with life. They help to see the physics "around us", educate students' observation skills.

In the process of solving problems, students acquire the skills to apply their knowledge to analyze various physical phenomena in nature, technology and everyday life; carry out drawings, drawings, graphs; make calculations; use reference literature; to use devices and tools in solving experimental problems, etc. Particularly useful in this regard are tasks that are solved using the work and life experience of students, the observations they make during excursions, when working in school workshops, and in industrial practice.

Problem solving also has a great educational value. With the help of tasks, you can familiarize students with the emergence of new ideas, pay attention to the achievements of science and technology. Solving problems is hard work, requiring a lot of effort, it can bring with it the creative joy of success, love for the subject, and the bitterness of disappointment, disbelief in one's own strength, loss of interest in physics.

Visualization system in the living physics project environment:

“The Living Physics” project environment allows modeling physical phenomena in a short time and with sufficient quality. The main class of phenomena is mechanical interactions. A distinctive feature of living physics models is the use of abstract objects of mechanical movement and interaction, which allows the teacher to form the modeling skills of schoolchildren at the stage of building a model in the classroom. A set of adjustable parameters of objects and processes, as well as a system of meters and recorders that is diverse in functionality, allows you to create a visual model of almost any task. Below are the developments of models that visualize problem situations when studying the topics "Oscillations" and "Electrostatics". The presented developments have a common structure: a model diagram, recommendations and tasks for the student and teacher to work with it.

Classic:
Using presentations and instructional videos to learn a new topic.
Demo Experiment.
Educational tables and posters (paper).
Solving graphic problems
a) the condition of the problem is presented in the form of a graph or supplemented by a figure;
b) to facilitate the solution of the problem, it is necessary to build a graph, make a drawing.
- Filling in the tables (when studying the section "Comparative Planetology", a summary table "Planets of the Solar System" is compiled with the most important parameters of the planets, which gives a more complete picture of all the planets).
Innovation:
Scribing - When studying a new concept, phenomenon, physical quantity, it is necessary to adhere to a certain scheme, sequence (what you need to know). This information is easy to present compactly on a blackboard using chalk or on a slide using animation so that the constituent diagrams appear in sequence. For example, an ideal gas, a heat engine, electric field strength, mechanical vibrations, the structure of the solar system, double stars, etc.
Mind maps - It is convenient to use when systematizing and generalizing the material, when it is necessary to link the individual concepts studied into a system, to show their relationship (gas laws, SRT postulates). Moreover, students can be provided with ready-made concepts that need to be correlated with each other and make connections, i.e. create your own mind map according to the blanks. This can be done both on paper (distribute printed concepts and blank sheets of paper, markers to students divided into groups) and electronically (Learningapps.org).
Structural and logical schemes - It is better to use it to organize the material of a large section (for example, thermodynamics, electrostatics). You can give ready-made schemes for filling, leaving some cells empty.
Timeline - This technique can also be used to systematize knowledge in a large section or several sections. For example, "Development of views on the nature of light." To do this, students are given key concepts, phenomena, names of scientists (wave theory, corpuscular theory, corpuscular-wave dualism, Newton, Huygens, shadow formation, dispersion, interference, diffraction, light pressure, photoelectric effect, etc.). They must arrange them in chronological order.
Thus, one can argue about the physical accuracy of the proposed models, look for flaws in them, but we did not set the task of ideally simulating the process, we constructed an image that allows only simulating general patterns. The teaching of any topic in a school course in physics (and not only physics) should be accompanied to a greater or lesser extent by the use of visual aids. This is due to the fact that the most effective information is absorbed by the student in the case when there are three components of its presentation - visual, auditory and kinesthetic. However, it is not easy enough to find effective visual aids for all topics. One example of such a topic is Ohm's law for a section of a circuit. In this case, the visualization of teaching can become quite effective - relying on the visual thinking of the student, working with some specially designed visual image that allows the student to model and represent the processes under consideration.
Visualization technology improves the quality of material assimilation due to the intellectual accessibility of the presentation of educational material. The combination of a visual image, text, oral explanation of the teacher allows you to take into account the individual characteristics of the assimilation of the material by each student, increase interest in the subject, and increase motivation to study it. The inclusion of visualization elements in teaching allows each student to learn in the most favorable conditions for him.

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