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PRINCIPLES OF DIDACTICS IN COMPUTER SOLUTION OF NON-STANDARD PROBLEMS FROM PHYSICS IN GENERAL SECONDARY SCHOOLS

Abstract: *This article describes the principles of didactics in a logical, consistent and scientific way in solving non-standard problems in physics in general secondary schools.*

Key words: *activity, act, joint, stage, period, principle, process, event, feature, education, development, system, worldview, upbringing, connection, harmony, interest.*

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Introduction

Selection of non-standard problems at all stages of computerization of non-standard problems in physics, from pedagogical, didactic, methodical processing to them, designing the content of teacher and student activities, construction of events on the basis of psychological, pedagogical, didactic, methodological requirements. Without setting such requirements, it is difficult to computerize the process of solving non-standard problems in physics, to think about its effectiveness. Principles are a general didactic category, which includes all types of education (individual, group, general class), levels (primary, secondary, vocational, higher), subjects (teacher, student community), all components of the educational process (purpose, objectives, content of education, methods, organizational forms, results). Problems of implementation of general didactic principles in computer education have been studied by such scientists as V. T Jitomirsky, V. M Monakhov, V. Novijov, I. Robert.

There are a number of didactic requirements for the organization, management and control of the process of solving non-standard problems in physics, which must be met in computer education. We will briefly discuss such requirements below. One of the main requirements for solving a non-standard problem in physics is science, and the scientific principle of didactics requires that in the educational process students acquire knowledge that is scientifically sound, meets the level of development of modern science. The scientific principle must be reflected in computer education. The realization of this requirement equips students with a system of theoretical knowledge that is the foundation of the scientific worldview, increasing their interest in knowledge.

Systematization of education is the principle of didactics, which should correspond to the internal logic of the subject and the age and psychological characteristics of students. The structure of education requires the correct placement of the text of the training material, the sequence of non-standard problems and assignments, the process of their implementation, the stages of the lesson, etc., depicted on a computer screen in computer education. This means that it is not possible to ensure the conscious mastery of solving non-standard problems in physics by dividing non-standard problems and assignments from physics into different parts and explaining them to students in a chaotic manner.

In solving a non-standard problem organized in accordance with the structural principle of didactics, the physical quantities in the problem structure and the connections between them are mastered by students in a logical connection. This shows that the principles of structure and sequence are one of the didactic principles that must be followed in computer education. Although several properties of each size involved in a non-standard problem condition are studied from physics, these properties must be placed in a sequence that is easy to master, and the first property must be linked to the second, the second property to the third, and so on. As the Czech pedagogue Y.A. Comenskiy who was the first to advance and scientifically substantiate the principle of systematization in education, said, "Just as everything in nature is interconnected, so in education everything must be interconnected" (5).

The next principle of didactics is the principle of the connection of theory with practice. Science is firmly separated from the body and life, with practice, with the needs of production, on the basis of the practical needs of mankind. Therefore, it is necessary to demand that the principle of integration of didactics with theory and practice be followed in computer education. In realizing the strong connection of theory with practice, the vital need, the laws of social experience are reflected. Particular attention should be paid to the principle of comprehensibility, which is related to the fact that the content of non-standard problems described on the computer screen is relevant to students and requires a certain student effort in solving non-standard problems that require a computer. “Understandability of education means that the content, description and volume of educational material correspond to the level of preparation of students and the development of their learning opportunities” (4).

The principle of comprehensibility of didactics must be followed in computer education. This requirement must be met by ensuring that each frame content on the computer screen is appropriate to the level of comprehension of the students and that it is appropriate to the students' perceptual capacity with features such as exchange, repetition, and image speed. “Consciousness of teaching the principle of comprehension should not be viewed as a student” (3). Such misunderstandings and the content of the training material, the corresponding issues, assignments and questions in a light, superficial way, and their application to education can lead to negative consequences. “If a child can do everything easily, then he will gradually develop laziness of thinking, lead the child astray, form a light-hearted attitude to marriage. Surprisingly, thinking laziness is also common in gifted students. Laziness in the learning process begins to develop when education is organized, following the challenges that students are able to overcome ”(5).

One of the leading factors in educating students to live, to fight, is to overcome the challenges that empower them. Thus, difficulty is a subjective phenomenon, and the desire to overcome, it is crucial in cultivating and developing in the student such personal qualities as endurance, perseverance, and fear of hardship. The principle of comprehensibility of didactics requires that the learning process be neither too easy nor too difficult for students. Because the ease of non-standard issues not only reduces mental activity, but also reduces interest in reading. The interrelationships in solving non-standard problems from physics and how skillfully they do this work are of great educational importance.

After all, it requires students to be able to solve non-standard problems in physics, to analyze the non-standard problem under study, to see them in different attitudes and situations, to draw scientific, well-founded conclusions. Non-standard problem-solving from physics is mastered deeply and firmly only when it is combined with the knowledge of the text being described. While the use of interdisciplinary connections helps to ensure the perfect and thorough theoretical knowledge, practical skills, competencies in solving non-standard problems in physics, the use of interdisciplinary connections is no less important. Establishing interdisciplinary communication increases students ’knowledge levels, develops independent thinking, expands their minds, and helps to transfer their knowledge from one subject to another. Increases students' interest in knowledge, provides an opportunity to prepare for practical activities. The use of interdisciplinary connections ensures that students ’knowledge is robust, conscious and active in their acquisition. Coverage of both interdisciplinary and intradisciplinary connections in the context of non-standard problems in physics has a great impact on the development of skills and competencies in students, such as comparison, generalization, inference. Therefore, it is appropriate to demand that the principle of ensuring interdisciplinary and intradisciplinary coherence in computer education be implemented.

"No matter what you teach a student, if he is shown how it can be useful in life, the student will learn it more easily," writes Czech pedagogue Y. A. Comenskiy (5). Indeed, the relevance of education to life is important in students ’mastery of the learning material. Hence, the principle that science is related to life must be followed in computer education. The solution of non-standard problems related to marriage, the production of theoretical knowledge and its application in practice are different phenomena, but they are closely related. The task of linking a non-standard issue to life requires that the content of the non-standard issue text displayed on a computer screen reflect national and universal values. For this purpose, we believe that in the context of a non-standard issue, it is necessary to reflect the views of nationalism, conviction, morality, respect for the motherland, science.

The teacher adapts to the student's level of preparation, taking into account the pace of work. This has a positive effect on the effectiveness of education. These functions of the teacher's activity can be loaded into the computer system. In other words, there are great opportunities to implement this principle in computer education. Encouraging the student to acquire knowledge makes him accustomed to thinking, working independently and solving non-standard problems of creative character. To do this, first of all, it is necessary to organize the solution of non-standard problems in physics in such a way that the student actively participates in solving them, learns the information displayed on the screen withinterest, let him observe about them.

One of the main factors that lead a student to creative activity is interest. Computer education, on the other hand, is sure to be fun for the student. Because the interest in solving non-standard problems in physics is one of the necessary conditions for effective mastering and memorization of the studied material. Interest is inextricably linked with all aspects of education, its functions. In this way, the student's psyche, hard work on the learning material, the development of creative activity is achieved. Hence, explaining the importance of the topic being studied in order to make non-standard problem solving interesting in physics cannot be accomplished by achieving a high level of student mastery. At the same time, the order of solving non-standard problems in physics on a computer screen should be interesting for the reader. Curiosity reflects a student's attitude toward reading, the power of inclination according to the content of the subject. The power of inclination satisfies the student's sense of thirst for knowledge, paving the way for the search for means. In computer education, the principle of didactics for the development of student cognitive activity should be followed. Leading psychologists, educators and methodologists: Y. K Babansky (1,2), A. M Matyushkin (6), M. N Skatkin (8), N F Talyzika (9,10) and others. Their research analyzes various forms, conditions, methods, techniques, ways, means, factors, stages of increasing the cognitive activity of students in the educational process, provides relevant scientific conclusions, methodological recommendations.

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