INCREASING MOTIVATION IN PHYSICS CLASSES THROUGH THE APPLICATION OF CRITICAL THINKING DEVELOPMENT TECHNOLOGY

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Abstract. *The article provides data on the potential for increasing motivation in physics classes through the use of technology for the development of critical thinking, and also describes information about the positive dynamics in the development of students' learning and knowledge using educational methods and technical means. To do this, it is necessary to correctly determine the forms, methods and means of providing educational information on general physics in optimal accordance with teaching technology.*

Keywords: *general physics, student, teacher, motivation, cognitive activity, critical thinking, theory, development, knowledge, skills.*

The problem of the current state of teaching general physics in the higher educational system lies in the pedagogical and psychological contradictions that have emerged in recent years. On the one hand, there have been changes in the structure of the general physics course, the goals and objectives of teaching, and the requirements of a competency-based approach to assessing students' results in teaching physics have clearly emerged. On the other hand, in pedagogical practice traditional teaching methods are widely used, focused on students obtaining ready-made theoretical knowledge in general physics, the reproductive nature of students' work, there is a lack of ways to build (or design) a system for teaching the physical process and methods of its application in pedagogical practice.

In General Physics classes, increasing student motivation can initially be shaped by public opinion. The majority of the adult generation talks about the complexity of the subject of physics and about many other subject difficulties (for example, complex mathematical apparatus) that they had to face in the process of studying it. As a result, in physics classes we can see the bored faces of students, encounter low cognitive activity in physics classes, a lack of interest in the subject and a culture of doing homework, and even a reluctance to study in general.

Psychologists distinguish the following stages of students' cognitive activity: curiosity, inquisitiveness, cognitive interest.

Table 1 indicates the characteristics of students at each stage of the lesson, the goals of the teacher's activities, and the means of achieving them.

The goals in the study of general physics are not training as such, in which the content will be only theoretical and practical knowledge, skills and abilities, but education and the formation of an intellectually developed personality. The teacher was faced with the task of creating an interactive teaching atmosphere in which students, together with the teacher, actively work on assignments, consciously reflect on the learning process, monitor, confirm, refute or expand theoretical knowledge, new ideas, feelings or opinions about the world around them. To implement this practical task, technology for developing critical thinking can be used.

Table 1

Stages of cognitive activity of students

Features of the student's condition	Student's subject of interest	Purpose of the teacher's work	Means of achieving teacher goals
First stage: curiosity			
There is a need to understand what the new physical process or object under study represents. The state turns into a positive or negative attitude towards an object that has caused an indefinite reaction to the study of a physical object.	External aspects of the lesson - physical experiments, frontal laboratory work, technical equipment, the style of work of the teacher, traditional or interactive forms of work in the lesson, scientifically based physical facts, processes, phenomena.	Attracting the student's attention, forming a positive attitude towards the subject that aroused their curiosity; accumulation of physical theoretical knowledge.	Demonstration of effective experience, a story about an interesting case of the discovery of physical laws, an unusual application of a physical phenomenon in practice, viewing video materials on the topic studied; use of scientific information related to the students' area of interest.
Stage two: curiosity			
The desire to become more familiar with the subject. Students ask questions, engage in discussions, and try to find answers to questions on their own.	The content of educational activities takes into account the interests of students. Installation on knowledge of physical laws. The ability to provide an explanation of the physical facts, experiments, processes, and phenomena under consideration.	Supporting the student's desire to learn more and more new things, to experience a feeling of joy from the learning process. Formation of the ability to set goals and systematize knowledge.	Systematization of knowledge: developing the skills to set goals and plan activities to achieve them.
Third stage: cognitive interest			

The pursuit of solid physical knowledge and its application in everyday practice. Manifestation of volitional efforts, non-standard thinking and tension of thought.	Serious interpretation and generalization of theoretical material.	Construction of a trajectory of cognitive motivation of students.	Organization of initial research work for students in physics; involvement in active participation in scientific and practical conferences and subject Olympiads

Ginny Steele and Kurt Meredith are among the founders of this technology, who applied it through reading and writing at the end of the twentieth century in the USA [2].

Critical thinking is evaluative, reflective, creative and developmental thinking by applying new theoretical information to life's personal experiences.

The technology for the development of critical thinking is based on the theory of meaningful learning by L.S.Vygotsky "... every reflection is the result of an internal dispute, as if a person were repeating in relation to himself those forms and methods of personal behavior that he had previously applied to others" [1. P. 274].

Let's consider the application of the above technology using the example of a physics lesson, which assumes a lesson structure consisting of three stages: the challenge stage; comprehension of theoretical material; stages of reflection.

The "Challenge" stage is the updating of existing theoretical knowledge in physics: awakening interest in obtaining new theoretical information; setting by the student his own learning goals in physics. At this stage, the following techniques can be used: "Paradox", "Black Box", solving a crossword puzzle with historical information, rebus, testing, creating a cluster, "Knowledge Conflict", "True-false statements", etc. [4. P. 250]

The "True-false statements" technique will help increase motivation to study new theoretical material. Students must give the answer (individually or collectively) "True" or "False", relying on their own ideas or simply guessing, thus connecting the educational subject with their everyday experience, set themselves up to study a new topic, focus their attention on key points, to compare existing theoretical knowledge with new ones, waiting for the correct answers allows you to maintain attention until the end of the lesson [3].

The stage "Comprehension of theoretical material" is aimed at obtaining new information and adjusting the student's goals for learning physics. At this stage, the "Insert" technique can be used. The technique is implemented through marking the text that the student is studying to achieve a previously set goal: "V" - known information; "+" - new information; "?" - unclear information; "-" - information that goes against existing ideas and theoretical knowledge. After working with the text, a discussion is held with obligatory reference to the source text and quoting. The goals set at the first stage are adjusted, specified, and supplemented (Table 2).

The "Insert" technique allows the teacher to monitor each student's work with the text of the textbook and give a mark for intellectual work in the lesson. This technique is best suited for learning new theoretical knowledge, when you need to work through a large amount of theoretical material in physics [5. P. 96].

Table 2

Reception "Insert"

Information	V	+	-	?
Information from the topic				

The “Reflection” stage is focused on reflection and the birth of new knowledge. From life experience, we all know that there are questions that are easy to answer, but much more often there are questions that cannot be answered unambiguously.

In conclusion, we can say that students’ critical thinking is not only possible, but also necessary to be developed at every stage of physics education. In this case, academic performance, the level of assimilation and quality of theoretical knowledge increase due to the mastery of students’ mental actions. Achieving academic success helps to increase student motivation, while the learning process becomes more meaningful, active and interesting.

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