UNDERSTANDING THE PHYSICAL PICTURE OF THE WORLD AND DEEP ACCEPTANCE OF THE BASIS OF PHYSICS ARE THE FOUNDATION OF SCIENTIFIC OUTLOOK OF THE SCHOOLCHILDREN

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ABSTRACT

This article discusses the understanding of the physical picture of the world and the deep understanding of the fundamentals of physics - the foundation of the scientific worldview of schoolchildren.

Keywords: Tendency, memory, picture, principle, hypothesis, system, knowledge, worldview, problem, matter, movement, category, formation, synthesis, force, energy, charge, dialectics, dualism, quantum, law, regularity.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

The information on physics reported to schoolchildren is extremely wide and varied and also tends to expand continuously. It is naive to believe that everything that students learned during physics classes will be preserved in their minds. The goal of teaching will be achieved if a certain part of scientific physical knowledge is preserved in the memory of students, namely an understanding of the basic facts, concepts, laws, principles and theories of physics, as a result of which a generalized scientific idea of nature is formed, or as it is now said, the physical world picture (PhWP), which is an essential part of a complete scientific picture of the world. This is one of the most common forms of human in nature. The physical world picture is a generalized of the most general concepts in itself, principles and hypotheses of physics, - a system of knowledge about the most general legitimate dimensions and properties of the physical world known to us (1; 31).

So, the PhWP is the main thing that should first of all remain in the consciousness of students as a result of studying physics at school, which is included in the scientific outlook as an important component. A lot of private knowledge, which in themselves serve as the basis for obtaining general knowledge about the world, can later be erased from the memory.

The PhWP is a synthesis of physical and philosophical concepts and ideas. It combines the problems of the types and structure of the matter, the motion of the matter, the problem of the essence of space and time, causality and regularity. But the matter, motion, space, time, causality, regularity are philosophical categories. So, teaching physics cannot be done without some philosophical generalizations, if one of the most important tasks of teaching physics is the task of forming ideas about the PhWP.

Understanding PhWP is an important, but not the only aspect of the scientific worldview. Physical science in the broad sense is not only a system of knowledge about nature, that is, it contains not only the ontological, but also the epistemological aspect. Moreover, it is characteristic that, as physics develops, the epistemological aspect of it becomes increasingly

important. “A characteristic feature of modern natural scientific cognition is the growing role of logic - epistemological prerequisites in the construction and interpretation of new natural science theories” (1; 118). In other words, in order to understand the object of physical research, physicists increasingly have to comprehend the cognitive act itself, the method and means of cognition, the ratio of the object and subject of cognition. Therefore, in the learning process, students need to gradually acquaint themselves with how scientific physical knowledge is built, what are the methods of science and the laws of scientific knowledge. The familiarization of students with the process of scientific knowledge requires addressing the problems of philosophical methods of cognition that is the subject of philosophy.

Thus, the most important component of the scientific worldview formed in teaching physics is generalized scientific knowledge of nature and the process of its cognition, based on specific knowledge of facts, concepts, laws and principles of physics, and those philosophical generalizations based on them.

However, it is important not only to imagine what components the already formed scientific worldview is made up of, but also how each component is formed.

What world picture will be formed in the student’s mind depends on what is studied in the physics course, how physical concepts and ideas are interpreted in the course. It is obvious, for example, that without acquaintance with the elements of quantum physics, the student will imagine the electron as a ball having strict localization and moving along a certain trajectory, which does not correspond to modern scientific views.

Of course, the range of issues studied in the lesson, and the level of their presentation are largely determined by the program and textbook, but it would be wrong to diminish the role of the teacher in this regard, since the scientific level and methods of interpreting program material are ultimately provided by content, style, the nature of the lesson. Therefore, when studying any question in the course of physics, it is important to highlight the side in it that is most important for the formation of the outlook, and it is on this side of the issue that students focus on. Here are the examples that explain the idea.

In accordance with the textbook for the VIII class, after studying the dynamics, the question is examined whether the laws of dynamics are always valid. Of course, students should understand that Newton’s laws are valid only in inertial reference frames. This is actually only discussed in the corresponding paragraph of the manual. However, the presentation of this question is useful to bring Galileo's relativity to the substantiation of the principle in order to show students that since no mechanical experiments can establish, whether the system moves uniformly and rectilinearly or is at rest, if all mechanical phenomena in all inertial reference systems proceed according to the same laws, then there is no fundamental difference between peace and uniform rectilinear movement. Understanding this idea is very important for the formation of a scientific worldview.

Here is another example. The experience shows that mistakes made by students in interpreting the content of a number of physical quantities are very typical. So, force is often understood by them not as a reason for a change in movement, but as a cause that generates a movement. Aristotle's understanding of power, inspired by a superficial assessment of worldly experience, is extremely tenacious.

Students tend to understand force, energy, electric charge, and the amount of heat as self-existent substances.

It is obvious that such interpretations are incompatible with the scientific understanding of natural phenomena. To prevent these misconceptions, one should not simply limit oneself to the introduction of any physical quantity with an explanation of the formula expressing the definition of this quantity, and emphasize that physical quantities are only characteristics of real objects and phenomena, only means of describing reality, and not reality itself.

The analysis of typical errors of students suggests that, due to the complexity of both the object of cognition and the cognitive process itself, truth is sometimes shunted by an easy but false path, onto which the mind of any person, and especially the mind of a schoolboy, is just emerging. To identify the difficulties and errors that students may encounter when studying the fundamentals of physics, and to prevent their occurrence are extremely important for the formation of the scientific worldview of schoolchildren.

It is also visible from the examples above that without formulating any philosophical conclusions, without using any philosophical terms, it is possible to create materialistic ideas about nature and its knowledge due to the nature, content, interpretation style of the main issues of the course of physics.

So, the first side of the process of formation of a scientific worldview in physics lessons is the communication of generalized knowledge about the basic concepts, laws and principles of physics that contribute to creating students' ideas about the scientific world picture and the process of scientific knowledge.

Dialectical interpretation of the foundations of physics

The formation of a scientific worldview cannot be regarded as a spontaneously occurring process that coincides with the communication of specific physical knowledge. It is difficult for students to independently rise to a consciously philosophical generalization of specific scientific knowledge, as a result of which they would have an idea of PhWP with difficulty. Additionally, if the teaching material of a physics course is presented in such a way that it gradually leads the student to dialectical generalization, then it is necessary to bring the presentation to its logical conclusion and make these generalizations, formulating those philosophical conclusions that naturally follow from the specific material, but which students themselves may not realize, if the teacher will not stimulate it. Numerous facts indicate that even schoolchildren who have learned the factual material of the course well can sometimes not give a dialectical interpretation of natural phenomena.

Scientific coverage of physical phenomena and laws, being a necessary factor in the formation of a worldview, is not enough itself to solve this problem, and special and systematic work is needed to educate the dialectical worldview. This work consists in the dialectical interpretation of physical phenomena and laws, in the process of which students inevitably come to some conclusions of a philosophical nature, that is, they actually get acquainted with some of the most important dialectical propositions and how they appear in physical phenomena and in the process of scientific knowledge of nature.

Of course, each philosophical generalization should be the natural result of considering a whole series of physical phenomena, and not be the result of artificially linking philosophy to physics, in which the logic of the subject is violated. To do this, in physics lessons, one or another

philosophical position must be disclosed, not in its entirety and universality, but only as a natural generalization of that specific physical material from which this statement follows. The philosophical conclusions themselves should be presented to students as the most general patterns found in nature itself, in the very process of cognition. Only after studying the philosophical section in the course of technical science, you can speak at the physics lessons without fear of being misunderstood about the laws and principles of dialectics. One should not be afraid to use such terms as “matter”, “motion”, “opposite”, “randomness” in physics classes in high school, if graduality is observed and appropriate explanations are given. This is precisely the characteristic feature of modern physics that it absolutely can no longer do without such concepts. The attempt to make philosophical generalizations, in some "non-philosophical" terms, can end only with vulgarization. Naturally, philosophical terminology should not be abused. We must take into account the logic of the subject and the age-related characteristics of students and introduce philosophical concepts, make generalizations gradually, carefully substantiating each of them in the process of presenting a specific educational material in physics.

What is the importance of this work, each of its meaning?
The dialectical interpretation of physical phenomena is the basis of the atheistic education of students; it is necessary for the conscious mastering of the philosophical section of the course of social science and instilling in students an interest in philosophical comprehension of reality.

Revealing the dialectical nature of physical phenomena helps students to better understand the essence of physical phenomena and patterns, and thereby improves the quality of knowledge of students in physics.

Indeed, in recent years, the ideas of modern physics have increasingly penetrated the school physics course. This process will continue in the future. However, it is known that one of the most natural features of modern physics is its complete incompatibility with the metaphysical method of thinking and its deep dialectic.

“Dialectics is the center of philosophical questions of modern physics .... The dialectic tendency, having emerged in the old classical physics, has spread widely in modern physics, deeply established in all its sections in its theoretical foundations” (3; 85). The statement provided by V.F.Yefilenko that “dialectics become an absolute necessity for natural science” (4; 520) perfectly characterizes the current period of development of physics. It follows that the problems of modern physics can only be correctly understood if they are approached from a dialectical point of view. This also applies to the study of modern physics at school. Here is just one example.

In order for schoolchildren to realize the meaning of the quantum-wave dualism of the nature of light, they must be deeply convinced that the unity and interaction of opposites is all the general law of reality. If, at the time of studying the nature of light, students on a specific material will be convinced of the naturalness and regularity of combination in one object or the phenomenon of opposite sides, then it will be easier for them to realize the dialectical nature of light. Actually, S. I. Vavilov wrote about this in 1944: “Despite the 20 years that have passed since the discovery of the unity of the corpuscle - a wave, a physicist, and even less a physicist, is not able to combine in a consciousness a stream of electrons in a single image or a light beam, both properties ... Inconsistency and mutual exclusion here cry out for themselves ”(5; 71). One should not be surprised that students in this case also think by the principle of “either-or”,

which is quite consistent with formal logic and “common sense”. The truth lies in the understanding of light as a unity of wave quantum properties.

Since the most fundamental ideas of modern physics will increasingly penetrate the school course, it is legitimate to assert that further progress in physical education is directly dependent on the level of development of dialectic views and dialectical thinking among young people. To build the process of teaching physics at school and in a university, without taking this into account, is completely unacceptable. Consequently, the formation of dialectical views among students constitutes an internal need for teaching physics.

So, the second side of the process of forming a scientific worldview in physics lessons is the dialectical interpretation of the foundations of physics, in the process by which schoolchildren are led to some generalizations of a philosophical nature.

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