Guidelines for teaching physics in secondary special educational institutions

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A systematic approach to the formation of methodological knowledge among students in the process of teaching physics

The effectiveness of teaching physics in our time is determined not only by the volume of acquired subject knowledge, but also by the formation of students ' skills and abilities to independently acquire new knowledge in the course of educational and further work. Over time, as a result of training, when some facts, formulas, conclusions, definitions are partially forgotten, students should have fundamental knowledge and those intellectual skills and abilities that allow a person, regardless of the type of activity, to understand new phenomena and tasks, and successfully implement a creative approach to solving production and life problems. The methodological knowledge acquired in training is of great importance.

The didactic and methodological status of the term “methodological knowledge” is a logical organization, methods and means of activity, the principles of construction, forms and methods of scientific knowledge". In accordance with these definitions, methodological knowledge in the course of physics in secondary schools should be understood as generalized knowledge about the methods and structure of physics, the main laws of its functioning and development.

It should be emphasized that this knowledge is not some external added to the basics of physics additional to the noticeable in the traditional sense of the word, knowledge, on the contrary, they are intrinsic to the modern course of physics. It is known that three main elements form the backbone of the General scheme of physical science:

1)the basic concepts and theories developed by physics to this point.

2)research methods and fundamental facts about nature obtained with their help.

3)applications of physics to other branches of science and technology. These three elements in the academic subject "Physics" must correspond to certain knowledge. Subject methodological and Polytechnic. Until recently, physics was presented in secondary schools mainly as a system of subject knowledge. However, physical science includes not only a system of knowledge, but also reflects a certain area of social and industrial practice, the process of obtaining knowledge. Analysis of the current state of physics teaching and students ' knowledge in this plan reveals a number of significant shortcomings:

1) students do not form a sufficient understanding of physics as a system of knowledge about nature that develops over time. Students ' physical knowledge is rather a collection of disparate facts and laws.

This is why the idea of generalizing physical knowledge is now recognized as very relevant. Many students cannot separate the main from the secondary in the educational material, the fundamental from the applied to distinguish individual components in the structure of physical science. The main reason for this situation is the lack of a number of methodological knowledge in the content of teaching physics.

2)Despite the inclusion of the main ideas of modern physics in the content of education, many students do not overcome outdated and even pre-scientific ideas that have developed intuitively in the course of their life practice. According to a special pedagogical experiment verified by the author and independently by a number of other researchers ,after studying mechanics, the Aristotelian idea of the nature of motion and rest, the force of inertia remains, after studying the basics of relativity, the students ' idea of the absolute nature of space and time in the Newtonian spirit remains unshaken, and they perceive the conclusions of SRT as paradoxes, etc.

We can talk about a stable psychological and didactic phenomenon when students in the study of physics face the difficulties that scientists themselves have encountered and overcome for a long time in the process of scientific knowledge. This fact is not sufficiently taken into account at the present time, often we learn to present ready-made knowledge without showing how it was obtained.

Practice shows a tendency to reduce interest in physics on the part of students. One of the reasons for this situation is the excessive formalization of educational material and insufficient consideration of students ' cognitive capabilities and learning motives. It is necessary to take into account that the conditions of universal and compulsory secondary education in our country have shifted and the value aspects of education. Along with such training motives as preparation for admission to University, early identification and development of aptitude for physics in individual students, the so-called ”physics for all ”comes forward. In this regard, the worldview and humanitarian trends that show physics as one of the components of universal culture as the result of people's activities aimed at the welfare of people should be strengthened.

Overcoming difficulties in solving problems the formation of a dialectical-materialistic worldview and Communist conviction of the development of scientific and technical thinking and creative abilities in students we see in a certain systematic approach to teaching physics. Its essence consists in such an exposition of the basic physical ideas and theory in which not only the results are studied but also the methods of obtaining knowledge developed by science in the process of cognition of nature. In this approach, the historical spectrum is subordinated to the methodological one as a means for forming students ' methodological knowledge.

In this approach, methodological knowledge serves as a generalizing function of teaching physics in secondary schools, which led to the inclusion of elements of the history and methodology of physics, logic of science and science studies in the course content. Of course, this knowledge is extremely extensive, so there is a problem of their selection for educational purposes of constructing a didactic complex of

methodological knowledge that meets the criteria of necessity and sufficiency. As a result of the research, didactic requirements for educational material of a methodological nature introduced into the physics course of secondary educational institutions were identified.

This material should:

1)to serve the conscious assimilation of physical knowledge an in depth understanding of the essence of the phenomenon and laws being studied;

2)To develop a correct dialectical-materialistic worldview;

3)reveal the nature and dialectic of scientific knowledge equip students with General scientific methods of knowledge;

4)contribute to overcoming a narrow practical understanding of physics,

5)show physics as one of the components of universal culture and the basis of modern technology;

6)form such personality traits as patriotism and internationalism, humanism and citizenship, and the desire to benefit people with high moral qualities.

Taking into account the specifics of the training process, the selected methodological material should, however:

1)Meet the age and cognitive capabilities of students;

2)be compact and systematic closely related to subject knowledge;

3)be interesting for students cause positive motivation to learn;

In the proposed system of formation of methodological knowledge, all their contents are combined into 5 main components around which the entire educational material of the physics course of secondary educational institutions is generalized:

1)Scientific experiment and experimental research method.

2)Physical theory and theoretical research method.

3)Core methodological ideas of physical science.

4)Basic laws of development of physical science.

5)Elements of scientific biography

Literature

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