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TEACHING PRIPNCIPLES OF PHYSICS HISTORY IN SECONDARY SCHOOLS

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Abstract.*In this article we discuss the problem of physics history in educational system. On the issue of physical education in the 21st century, it was noted that even graduate students do not have a correct understanding of the significance of the most important works of domestic scientists. Students have poor knowledge of the factual material about the life and work of a particular scientist; confuse the names of scientists, attribute to them other people's inventions; cannot name the names of domestic scientists. All this once*

Keywords: *modern physics, science of nature, physical concepts, real experiment*

Прицины преподавания истории физики в средных школах

Аннотация.*В данной статье обсуждаются основы преподавания истории физики для учеников школы. Многие ученики имеют мало представлений об истории физики, истории ведущих ученых физиков мира. Поэтому проблема преподавания настоящего курса имеет огромное значение для учеников в дальнейших их жизнедеятельности. В дословном переводе с греческого слово «физика» означает «природа», следовательно, физика — это наука о природе, изучающая простейшие и в то же время самые общие свойства материального мира. Физика является главной из естественных наук, так как она открывает истины, действительные для всей Вселенной. История и законы физики являются основой знаний об устройстве и функционировании Вселенной, они лежат в основе научного осмысления действительности.*

Ключевые слова: *современная физика, естествознание, физические понятия, реальный эксперимент*

O‘rta ta’lim maktablarida fizika tarixini o‘qitish prinsiplari

Annotatsiya.*Ushbu maqolada maktab o‘quvchilariga fizika tarixi va taniqli fizik olimlar haqida ma’lumotlar berish masalasi muhokama qilingan. Fizika tabiiy fanlarning asosiysidir, chunki u butun koinot uchun amal qiladigan qonuniyatlarni ochib beradi. Fizika tarixi va qonunlari koinotning tuzilishi va evolyutsiyasi to‘g‘risidagi bilimlarning asosi bo‘lib, ular qonuniyatni ilmiy tushunishga asoslanadi. Buning sababi shundaki, biz fizika tarixinini bilmas ekanmiz zamonaviy fan to‘g‘risida aniq tasavvurlarga ega bo‘la olmaymiz.*

Kalit so‘zlar: *zamonaviy fizika, tabiat fani, fizik tushunchalar, haqiqiy tajriba*

Introduction

Currently, there is an intensive process of updating and improving education in schools, which requires the development and implementation of new forms of

education. They are aimed at the interpenetration of sciences in school courses. When solving this problem in the conditions of the modern school, it is necessary to strengthen the elements of the history of science in the teaching of physics. The tasks of teaching the fundamentals of school physics include not only familiarizing students with scientific facts, laws and theories, but also with the history of the discovery of laws and the development of theories. For the first time, the question of introducing elements of the history of physics into teaching in secondary school was raised at the congress of teachers of physical and mathematical sciences of secondary educational institutions of the educational district in 1890. At the congress, the question of introducing historical information into the teaching of physics was discussed, limiting it to the biographies of scientists. The main purpose of introducing elements of historical science into secondary school was to broaden the horizons of students, draw their attention to the subjects of the natural science cycle, and assess the role of these sciences in the life of society. At the next congresses and meetings devoted to the problems of teaching physics, this issue was repeatedly discussed again. More specifically, tasks were outlined, the solution of which should be historical material, a significant expansion of historical information was observed in the process of teaching physics. In 1994, at the VI Stoletov Readings, held at the Pedagogical University, much attention was paid to the history of physics and the use of historical material in teaching the physical disciplines of the school. At the congress of physicists, held at University. Lomonosov in June 2000, on the issue of physical education in the 21st century, it was noted that even graduate students do not have a correct understanding of the significance of the most important works of domestic scientists. Students have poor knowledge of the factual material about the life and work of a particular scientist; confuse the names of scientists, attribute to them other people's inventions; cannot name the names of domestic scientists. All this once again emphasizes the importance of using historical and local history material in the process of teaching physics. Methodist A. I. Yantsov indicates the reasons that determine the appropriateness of using historical material and identifies the following conditions: if the concept and theory disclosed by the student are complex and require strict logic in the disclosure of individual aspects; if the ideas and concepts that students have are opposite to modern scientific concepts and ideas, but identical to the ideas that once existed in science and were rejected in the course of historical development; if a historical approach helps students to better motivate and discover the vital importance of a new problem; - if the historical approach significantly enhances the evidence of the presentation.

The use of information on the history of physics in the classroom was given great attention in the works of such scientists as V. I. Lebedeva, I. K. Turysheva, A. V. Usova, and E. V. Savelova. based on the use of information from the history of the development of science and technology; the issues of formation of scientific worldview among students are considered; the basic principles of selection of historical material are recommended; types of educational material with historical content are determined; - some ways of implementing the introduction of this material into the educational process when studying the basics of physics in high school are highlighted. It should be noted once again that the ongoing connection between the teaching of physics and the historical content of physics makes it possible to concretize and clarify general scientific knowledge, makes theoretical provisions more understandable, intelligible, and easier to assimilate. Facts that are closer and more understandable to schoolchildren have a strong emotional impact, which ensures the most successful perception and assimilation of the material. In the domestic methodology of teaching physics, the main tasks have always been: determining the goals, content of the subject of physics, clarifying the methods, methods and means of teaching students the basics of the science of physics. This is pointed out in the work of the well-known methodologist I. I. Sokolov, who also noted that one of the basic principles for constructing a program in physics is the principle of historicism. This principle was understood by him as the inclusion in the program of questions of the history of the development of science, while in the process of teaching the teacher is tasked with revealing the dependence of the history of the development of science on the production needs and requirements of society in solving specific problems of a particular period of human development.

The most interesting are the following provisions of P. A. Znamensky, one of the founders of the Russian method of teaching physics: the history of science makes it possible to understand that physics is a continuously developing science and an updated area of human knowledge; the use of elements of the history of science makes it possible to understand how, under the influence of certain practical needs, scientific problems arose and scientific research proceeded, and how the development of technology and production technology allowed science to overcome the problems it faced, which led it to a new level; the history of physics gives an idea that the generalizations that physics comes to consist of a number of historically connected steps, and that a lot of time can pass between the birth of an idea and its implementation in practice; The history of science allows us to see that scientific discoveries were not the work of only individuals, but were always the result of the collective creativity of scientists, even if they lived in different

countries and at different times. Thus, the relevance of the work is due to the role played by the principle of historicism in the theory and practice of scientific and educational knowledge, as well as the need to identify the conditions and means for implementing the principle of historicism and their influence on the development of students' thinking.

Results and discussions

The purpose of the work: the formation of competence in the field of cognitive activity through the use of historical material in the course of physics Tasks: To increase the level of cognitive interest of students; To form a scientific worldview in students; Develop the ability for active practical activity; To educate civic consciousness and behavior; To form methodological skills in the study of physics; To develop the creative thinking of students, include them in creative activities. The use of historical material in teaching physics makes it possible to solve such important educational tasks as the formation of a scientific worldview, morality, ideological conviction, patriotism, internationalism, and love for science. Even today, changes are taking place in the development of the science of physics: the discovery of new phenomena, the establishment of laws, the improvement of research methods, the emergence of new theories. All this constantly requires the definition of historical and logical correlations in scientific and educational knowledge, as well as ways to implement this principle in the educational knowledge of physics. The educational possibilities of teaching through the historical principle are most fully realized in the classroom. In the classroom, students perceive the content of the educational material, develop their own attitude to it, and form a variety of skills and abilities. By identifying and using historical facts in the process of teaching, it is possible to solve important educational tasks, the tasks of developing thinking, and maintain students' interest in physics much more effectively.

The form of presentation of educational material with historical content on the pages of textbooks is traditional . It contains: a brief biographical note; photograph or portrait of a scientist; mention of the discovery of a phenomenon, law; description of historical experience; enumeration of a number of names of scientists.

An analysis of the educational literature allows us to say that the historical information given in the textbooks, and with them the knowledge given to students, is given as something frozen, unchanged, given once and for all. The teacher needs to show how scientists come from less deep and accurate knowledge to achieve deeper and more accurate knowledge. The teacher must, in the process

of forming physical concepts and laws, show their historical development, reveal the struggle of views and ideas. In order to arouse a steady interest among schoolchildren in physics-science, it is necessary to reveal the evolution of physical ideas, the reasons that prompted the adoption of this or that idea, the mechanism of scientific search, the atmosphere of the creative process. Talking about the birth of new ideas and their evolution, one should not neglect the details, some "trifles", curious episodes. They can revive the story, but it is not they who give rise to persistent interest, but the very process of searching for truth with its internal logic, with its inevitable zigzags and even reversals and with the inevitable acquisition of truth. Thus, historicism in the teaching of physics is one of the important means of developing students' interest in science. For example. When considering the subject of falling bodies, the lesson begins with a story about how people, observing the speed of the fall of various bodies, encountered very mysterious phenomena. Here, for example, (from the wind) an apple came off and quickly fell to the ground. And why leaves from the same height fall rather slowly? One might think that the difference in their speed is due to the difference in their mass: heavy bodies reach the ground much faster than light ones. From this we can conclude that the speed of falling bodies depends on their mass. This speculative conclusion was reinforced in its time by the authority of the great ancient Greek thinker Aristotle. Its authority was so great that for about 2000 years it never occurred to anyone to check it, although remarkable thoughts about the role of experiment as an "expert" of the theory were expressed. So, even John the Sophist (XI - XII centuries) taught: “Although you are strong and skillful in these (beginnings), nevertheless, without experiments, your opinion cannot become reliable, and only experience is reliable and unshakable ... For you must know not only what was before (to know the past from the experience of past generations), but also by the grace of God to be self-possessed, i.e. to have your own opinion, verified by experience” In Europe, the first to realize the importance of experience for natural science was the great Galileo Galilei (1564 - 1642). As a young (25-year-old) scientist at the University of Pisa, in 1589 he was the first to test the conclusions of Aristotle, having the motto: “He who talks about nature, instead of observing it and using experiments to make it speak, will never know it. Only experience removes the veils from the secrets of nature. And in numerous experiments he was convinced that a small rifle bullet and a heavy cannonball fall at the same speed. When he told his colleagues and students about this, many of them, brought up in the spirit of the ideas of Aristotle, refused to listen to him and even ridiculed him: “What right has this young upstart to challenge the teachings

of the great Aristotle?” And Galileo had to climb with his cannonballs to the top of the Leaning Tower of Pisa in order to simultaneously release both the heavy cannonball and the light bullet. One can imagine the atmosphere of this historical event, when those present were convinced that heavy and light bodies simultaneously fall to the ground ... But a new problem arose before scientists: “Why is this happening? How can this be explained? Maybe the reason is the presence of air? No, after all, both bodies - both the core and the bullet - were moving in the air, and observing the fall in an airless medium (later), the researchers found that the speed of the bodies is the same in this case as well. Here is what the Nobel Prize winner E. Wigner writes about the remarkable regularity found by G. Galileo: “It should be considered surprising for two reasons. First, it is surprising that this regularity is observed not only in Pisa and not only in the time of Galileo, but also in any other place on the globe; it has always been and will always be... The second amazing feature... is that it does not depend on many conditions on which it could depend in principle. The pattern is observed regardless of whether it is raining or not, whether the experiment is carried out in a closed room or a stone is thrown from the Leaning Tower of Pisa, and who throws - a man or a woman. After such a vivid story about the fall of bodies, the teacher proceeds to consider the acceleration of free fall and then to the true reason for its constancy. And what interest is awakened is always assimilated better than what is studied only due to external motives, therefore historicism also contributes to a better understanding of physics. Acquaintance with the history of science not only shows how to think in order to understand nature, but also warns us against misconceptions. Historicism helps to improve the quality of students' knowledge. The history of physics and the history of technology are those powerful levers that, in combination with the material being studied, can significantly increase interest in science, broaden the student's horizons, and encourage him to active mental activity. Deep assimilation of scientific knowledge underlies the formation of a scientific worldview. In the course of the process of cognition, we receive reliable information about the world, i.e. comprehend objective truth.

The most important provisions disclosed in the lesson must be substantiated and convincingly proven. The presentation of historical material should also be substantiated. It is achieved by various means, the main of which is documentary. Its forms can be different - these are diagrams, photographs of genuine installations; data characterizing their scale and accuracy of measurements; statements and authentic formulations of the scientists themselves; descriptions of the era, working conditions of scientists, and sometimes an artistic description of

this or that discovery, reproducing with an acceptable degree of conjecture the atmosphere of the discovery. All this allows you to introduce the student into the environment in which the discovery was made, to provide to some extent the "effect of presence" during the discovery, to convince the student of the reliability of historical information. The nature of the teacher's presentation of historical material is extremely important. What is appropriate here is not academicism and impartiality, but an uninhibited, lively manner of presenting the material, which must be combined with clarity and logical rigor in unfolding the course of the historical process. The most effective methods of teaching physics are those that reflect the methods of this science.

Methods of scientific knowledge help to master educational tasks. This changes for the better the attitude of students to problems, their solution. However, students need to be reiterated that finding the answer to each learning problem is an exploratory, creative, and difficult process. Solving a problem, they make "discoveries" that cause emotional experiences and introduce the general features of the scientific method. We use tasks that help to master the methods of cognition, tasks that reflect the history of the development of civilization and the ways of understanding the world by mankind. The historical material showing how the enrichment of scientific knowledge went on always arouses the interest of the children. Tasks with historical content can be conditionally divided into several groups. Tasks that characterize the state of scientific knowledge of the period when scientists first resolved issues now being studied by schoolchildren.

E. Rutherford wrote: “... An extremely excited Geiger called me and said: “We managed to observe several alpha particles scattered back ...” This was the most incredible event of my life. It was as incredible as if a 15-inch projectile fired at a piece of tissue paper bounced off it and hit the shooter. What did Rutherford mean by "cigarette paper"? What was the discovery?

Conclusion

One of the fundamental sciences of our planet is physics and its laws. Every day we use the benefits of physicists who have been working for many years to make people's lives better. The existence of all mankind is built on the laws of physics, although we do not think about it. Thanks to whom the light is on in our homes, we can fly planes through the sky and swim across the endless seas and oceans. We will talk about scientists who dedicated themselves to science. Who are the most famous physicists whose work has changed our lives forever. There are a lot of great physicists in the history of mankind.

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