

THE ROLE OF A SYSTEMATIC APPROACH IN IMPLEMENTING THE INTEGRATION OF PHYSICS AND MATHEMATICS IN THE TEACHING OF PHYSICS TO STUDENTS

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Abstract. *This article discusses the role of a systematic approach in the implementation of the integration of physics and mathematics in teaching physics to students.*

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The deep political and socio-economic changes that have taken place in our country in the last decade, the radical change of state, social and personal priorities, new education related to the renewal and improvement of the educational system placed the task of developing education policy at the center with special relevance for the higher education system, including pedagogical education. These changes in the educational system led to the transition of the center of the main issues in education to the ideas of personal oriented, customized, developmental education, which to a greater extent is not only a professional knowledgeable specialist, but also a highly intellectual, helps to form an educated person. To implement these ideas, it is important to increase the scientific-methodical level of teaching, to switch from the subject method of presenting the material to the widespread use of integrative communication. And in this, the principle of interdisciplinarity should take the leading place.

Recently, we have witnessed the development of the problem of interdisciplinary communication in various research works. A clear proof of this is the research conducted by a number of Russian scientists who have established various scientific cooperation relations with our country. For example, psychologists G.A. Berulava, E.N. Kabanova-Meller, N.A. Menchinskaya; teachers and methodologists M. N. Berulava, G. G. Granatov, N. V. Gruzdeva, I. D. Zverev, D. M. Kiryushkin, V. N. Maksimova, A. V. Petrov, N. I. Reznik, V. N. Retyunsky, A. V. Usova, V. N. Fedorova, I. P. Yakovlev in these dissertations on the methodology of teaching physics the problem is reflected. Also, S.N. Babina, A.A. Bobrova, E.S. Valovich, A.I. Guryeva, M.D. Dammer, Yu.I. Dick, B.C. Elagina, S.P. Zlobina, V.R. Ilchenko, I.S. Karasova, S.A. Krestnikova, B.N. Maksimova, E. Mambetakunov, T.E. Romanova, A. Yu. Rumyantsev, B.C. Samoilova, S.A. Starchenko, B.L. Tevlina, N.N. Tulkiboeva, V.D. Khomutsky, V.N. Yantsena, O.A. Yavoruk and others, despite the many works on this problem, in the materials of all Russian and international conferences, they emphasize the need to continue research in the field of various aspects of the implementation of the integration of physics and mathematics in the teaching of physics to students.

Interdisciplinarity is a reflection of interdisciplinarity in the content and methods of teaching, which helps students to have a more complete knowledge and deep understanding of the unity of matter and its forms of action. The laws of nature, the formation of a scientific worldview, the development of students' dialectical systematic thinking, and the ability to summarize knowledge on various subjects are among the main goals. The use of the integrated lesson type allows for a more logical justification of the sequence of learning subjects, the structure of the curriculum, the content of programs and textbooks.

In general, the problem of integration of disciplines in pedagogy is not new. This concept has a much longer history of development than the concepts of V.N. Fedorova, A.V. Usova, and V.N. Maksimova. That is, Ya.A. Komensky, K.D. It is embodied in the theoretical foundations of the organization and implementation of lessons in interdisciplinary relations of Ushinsky. Currently, most of the scientific researches, including scientific research works and dissertations, are dedicated to the secondary school. At the same time, all authors say that the problem of integrating subjects in higher education requires additional research, because the process of teaching students in higher education institutions has its own characteristics and characteristics compared to the educational process at school.

The analysis of the works in the considered direction allows to identify the most important issues that require research and problems that require solving in the theory and practice of interdisciplinary relations. At present, the levels and forms of integration of physics-mathematics in the teaching of students at the pedagogical university are not sufficiently developed. Their procedural and normative functions are not defined. Higher education programs in natural and mathematical sciences are not aimed at the implementation of interdisciplinary integration of teachers and students, therefore, in practice, educational and cognitive activities related to the connection of physics with mathematics have a superficial, random, declarative character. Although it provides information about the leading role of mathematics in the development of physics, it is not fully revealed.

Between teaching physics and the need to form a holistic view of the world; the need to develop the normative-procedural functions of the interdisciplinary system of physics and mathematics in the developmental education system in physics at the pedagogical university, and the insufficient development of the methodology and technology of implementing these connections; Due to the low methodological preparation of students to understand the need to implement interdisciplinary relations between physics and mathematics and to put them into practice, it is very important to implement the integration of physics and mathematics in the teaching of physics and to pay special attention to the systematic approach. As a result of paying attention to this aspect, it is possible to solve the problem that students in higher education institutions are not harmed by the insufficiently developed methods of interdisciplinary communication in teaching, and that they cannot independently transfer knowledge from mathematics to physics based on the principle of interdisciplinary communication.

In order to solve the above problem, special training of students is required at the pedagogical higher education institution, therefore, the relevance of studying the situation of the interdisciplinary system of physics with mathematics in the content and structure of teaching physics to students is very important. Solving this problem requires the development of appropriate technology for using the principle of interdisciplinarity in the educational process of physics in higher education institutions. In particular, the importance and relevance of the problem under

consideration, as well as the contradictions related to it in the theory and methodology of teaching physics, further strengthen the scientific level of the research. At the same time, it requires special attention to practical issues.

Finding the right solution to the problem helps to develop theoretical knowledge about physical objects in the implementation of the integration of physics and mathematics, because: the problem of forming a holistic meaningful image of the studied object is solved; the conditions of origin of concepts and laws are determined; methods of acquiring new knowledge are studied; an important aspect of the laws is revealed; private laws are consolidated; general scientific methods and methods are transformed into a means of cognitive activity; a connection is established between objective reality, visual and abstract mathematical forms of knowledge.

The main general scientific method of forming theoretical thinking is to move from abstraction to concreteness. This is achieved by creating idealizations - physical models that synthesize the integrated image of the studied object or phenomenon into a single system. The most important function of the model is the ability to describe it mathematically. It is the ability to move from a figurative to an abstract mathematical model and vice versa that allows full use of the ascension method. Hence the need for interdisciplinary connection between physics and mathematics to form students' theoretical thinking. The main step in this is not only combining the experimental method with the mathematical description of the experimental results, but also the mathematical description of the entire field of science under study. Therefore, in modern education, interdisciplinary relations between physics and mathematics have a special place in: mathematical description of the physical ideal model;

obtain a meaningful generalization;

finding private laws;

to provide a transition from an abstract mathematical model to its meaningful interpretation in physics.

The development of teaching technology in accordance with their normative and procedural functions helps to achieve the goal of the problem. He also takes the lead in developing the methodology for the implementation of interdisciplinary relations of physics and mathematics in higher educational institutions, as well as in determining the ways and means of improving the quality of students' knowledge of physics under the conditions of integrated teaching technology.

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