



STRATEGIES FOR USING AN INTEGRATIVE APPROACH IN TEACHING METHODOLOGY OF PHYSICS IN HIGHER EDUCATION

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ABOUT ARTICLE

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Abstract: This article describes the important aspects of interdisciplinary teaching of physics. It covers the teaching of physics in relation to mathematics, chemistry, biology and geography. It is shown that the generality of the methods used in different disciplines is ensured by interdisciplinarity.

INTRODUCTION

Physics is the science of nature in general. It studies matter and energy, as well as the fundamental interactions of nature that govern the movement of matter. Physics is sometimes called a "fundamental science" like other natural sciences (biology, geology, chemistry, geography, etc.). They describe a certain class of material systems that obey only the laws of physics. The modern stage of the development of science is characterized by the increasing interdisciplinarity and interpenetration. In recent years, the science of bionics has appeared, which uses information from physics, biology, psychology, mathematics, radioelectronics and other sciences to solve engineering and technical problems in the study of living organisms. In the qualification requirements developed for the undergraduate education in Physics, approved by the Ministry of Higher and Secondary Special Education of the Republic of Uzbekistan, the types of professional activities of bachelors, professional tasks, requirements for professional competencies, training of pedagogic personnel aimed at improving the process¹.

In addition, there is a need to implement interdisciplinary communication in physics education in the creation of a targeted training system for undergraduate students in physics². In this regard, the topics covered in the subject "Physics Teaching Methodology", in particular the topic "Interaction of the Physics course with other educational subjects", the role of interdisciplinary relations in physics

¹ Mirzakhmedov B., Gafurov and others. Physics teaching theory and methodology, Tashkent, 2010.

² Усова А.В. Методика преподавания физики. М.: Просвещение, 1998 г.

teaching, the creation of integrative courses based on physics education, are widely discussed. is focused on.

Interdisciplinarity as a didactic category.

The objective view of interdisciplinarity is also reflected in the process of teaching physics in general secondary schools. This is required not only by the scientific principle, but also by the tasks facing the general secondary school physics course. In particular, it is impossible to form a scientific outlook without establishing and opening connections with other natural sciences. Interdisciplinarity is a didactic category that is manifested in the study of academic subjects in an interconnected and interdependent manner in general secondary schools³.

Interdisciplinarity ensures:

- a sequence based on the formation of concepts;
- unity of requirements for knowledge, skills, qualifications;
- use of the knowledge obtained in the study of other natural sciences, in the study of physics;
- elimination of unreasonable repetitions in the content of educational parameters;
- show the commonality of methods used in various disciplines (generalization of knowledge);
- to reveal the interconnections of natural phenomena that show the unity of the world;
- preparing students to master modern technologies. Interdisciplinary communication can be classified according to chronological communication and information communication.

Chronological connections ensure that subjects are taught consistently over time according to the needs of each subject. Information communication is manifested in the unity of the interpretation of concepts, facts, and rules considered in the study of various subjects. Ways of interdisciplinary communication:

- use of knowledge gained in studying other subjects;
- performing complex experimental work;
- complex excursions;
- generalized repetition.

Teaching physics in connection with mathematics.

Modern physics develops in close connection with mathematics. Mathematics is not only the language of physics, but also of thought and logic. Mathematical methods are widely used in physics both in the processing of experimental materials and in the development of theories, which allow to penetrate deeper into the secrets of nature. In turn, physics has a significant impact on the development of mathematics. The interdisciplinary connection between physics and mathematics courses contains more opportunities to improve the scientific level of teaching each of these subjects, so the connection between them is necessary from the beginning of their study. A physics teacher in the formation of measurement skills and abilities of general secondary school students, school students in elementary school mathematics lessons with the scale of length, time, mass, temperature, measuring instruments The concept of line estimation should take into account the initial information about the speed of movement⁴.

Different definitions of the concept of physical size are given in scientific, educational and methodological literature. However, two common features can be distinguished for all definitions:

³ Dzhorayev M., Sattorova B. Theory and methodology of teaching physics and astronomy. Tashkent, 2015.

⁴ Tugalov F.Q. The methodology of interdisciplinary integration of physics with natural sciences in teaching physics// Science and society. Scientific-methodical magazine. - Nucus. -2022. – No. 2. – p. 133.

- Physical size means the quantitative characteristic of the studied object;
- The definition of a physical quantity is closely related to the ability to measure it in one way or another.

An important form of connection between physics and mathematics is solving mathematical problems with physical content. In order to develop a unified methodological approach and requirements, the content of these problems and the methods of solving them should be agreed upon by the mathematics teacher and the physics teacher. In this case, attention should be paid to the development of students' ability to perform operations by defining the units of physical quantities. As in physics lessons, in mathematics lessons, it is necessary to come to the same definition of mathematical and physical quantities, the same editing of rules, and the same requirements for the design of theories, graphic material and knowledge.

Teaching physics in connection with chemistry.

Physics and chemistry often complement each other, because the same phenomena in nature are considered in different directions in the lessons of these subjects. Actual, conceptual and theoretical interdisciplinary relations are fully manifested here. The most important concepts common to physics and chemistry include: matter, mass, weight, energy, molecule, atom. Basic laws are also widespread: conservation and transformation of energy, conservation of electric charges. The most important theoretical interdisciplinary connections between physics and chemistry are related to the study of the same theories: molecular-kinetic and electronic, atomic structure theory, etc⁵.

Important forms of connection between teaching physics and chemistry: solving physico-chemical or chemical-physical problems, conducting complex excursions, entertaining evenings in physics and chemistry, necessary for learning physics and chemistry development of visual aids. It is necessary to take into account and use the practical skills that students acquire in chemistry classes: skills of working with laboratory equipment, measurements, performing calculations, deriving formulas.

Teaching physics in connection with biology.

The relationship between physics and biology is ancient and effective. It expanded especially after the emergence of such sciences as biophysics, agrophysics, and bionics in the following decades. This interdisciplinarity is reflected in the study of relevant academic subjects. The connection between physics and biology can be interpreted as a connection between the general and the particular. The knowledge gained from biology only expands the knowledge within the framework of physical laws and helps students to understand the unity of nature. Consideration of issues related to the application of physics methods in biology will also help this⁶.

The relation of physics to biology has three aspects:

- Physics in living organisms. Examples of the role of physical processes in the flow of biological processes are given in the study of various topics in physics classes.
- Many principles implemented in living organisms are widely used in modern technical devices based on physics.
- The laws of physics are related to the processes that occur in nature in connection with human production activities.

To eliminate the negative consequences of such activities, it is necessary to use the knowledge of the laws of physics to protect nature.

⁵ Усова А.В. Методика преподавания физики. М.: Просвещение, 1998 г.

⁶ Турьшев И.К. и др. Межпредметные связи физики. – М.: Просвещение, 1992 г.

Teaching physics in connection with geography.

The knowledge gained in the geography course should be used in teaching physics. Many interrelated questions are first studied in geography classes and later used in physics classes. It is important to study the exchange of moisture, energy, and minerals in a geography course, and this is an example that helps to study the aggregate change of water in a physics course. The study of issues such as atmospheric pressure and compass direction are related to each other.

CONCLUSION

Implementation of interdisciplinary relations in the lessons of "Methodology of Physics Teaching" for students of physics and astronomy helps to systematize, thus, to ensure the depth and solidity of knowledge, to explain to students the whole picture of the world. At the same time, the effectiveness of teaching and upbringing increases, and the possibility of mutual application of knowledge, skills and qualifications acquired in classes on various subjects is provided. Academic subjects begin to help each other in a certain sense. The consistent principle of interdisciplinarity contains important resources for further improvement of the educational process.

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