

INTEGRATED TEACHING FUTURE PHYSICS TEACHERS

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Annotation: This article discusses the technology of preparing future physics teachers for interdisciplinary integration, presents a model of teacher training, the content and mechanism of technology application.

Key words: physics, technology, interdisciplinary integration, interdisciplinary communications, integrated lesson.

Introduction

It is no coincidence that physics is a product of human needs. Therefore, in both developed and developing countries, much attention is paid to the teaching of physics. A modern educational system should be technologically advanced, the distinguishing features of which are the diagnostic nature of goals and their compliance with the results [1]. According to A. A. Mashinyan, the technology in the broad sense is a model of the joint activity of the teacher and students to achieve the planned learning outcomes, and in the narrow sense, the model of the joint activity of the teacher and students to achieve a specific particular result [2].

V. A. Slastenin, considering pedagogical technology as an ordered set of actions, operations and procedures that ensure the achievement of a predictable and diagnosed result in the changing conditions of the educational process.

In our opinion, the above definition is clearer, reflecting the target and process components, characterizing the presence of such elements as flexibility, the ability to adapt to specific environmental conditions. At the same time, we note that the substantive component related to the emphasis on the procedural side of the technology “dropped out” of the definition. In our understanding, the training technology model is implemented in two stages, ensuring the unity and integrity of the technological chain. At the first stage, verification and clarification of the correctness of the content of each component is carried out with correlation with all other environmental conditions, and at the second stage, their refinement during implementation. At the same time, the technological chain allows you to build any private training technology, taking into account the characteristics of the educational environment, the specified level of training (bachelor, specialist, master), the profile of the university (teachers are trained by classical and even technical universities), the level of teaching staff and material base.

Therefore, the technology of preparing the future bachelor of physical education for the implementation of intersubject integration includes:

- the first stage, involving the updating of existing knowledge and the formation of theoretical ideas for courses and disciplines that will become fundamental for establishing

interdisciplinary connections in the study of physics, for which teachers should have an idea of the connections and, if possible, focus on them;

- the second stage is connected with the study of a course in general physics, whose task is to establish interdisciplinary connections, which will greatly facilitate the further preparation of the future teacher for their implementation, for which there are many examples of interaction between sciences in various topics (the base of interdisciplinary knowledge).

The study of classical mechanics allows us to consider the use of knowledge of physics in technology, and on some topics (for example, the basics of dynamics, statics, mechanical vibrations and waves) to establish connections with biology (elastic properties of living tissues, leverage in living nature, sound and waves). In molecular physics and thermodynamics, one can identify the relationship between physics and chemistry (thermodynamic equilibrium, entropy), biology (surface tension, capillarity, heat regulation), geography (convection, phase transitions), as well as tripartite connections (physics, chemistry, and biology).

Electrodynamics is a section whose concepts and laws are widely used by chemistry and biology, since the structure of matter in chemistry, in the structure of biological molecules, chemical bonds, metabolic processes in living matter, transmission of nerve impulses and much more is explained from the point of view of electricity, many research methods tissues - from the point of view of wave optics. Photosynthesis, the nature of chemical bonds, electron shells of atoms, various methods of chemical and medical research, etc. They can be considered in quantum physics. After two stages, there comes the stage of methodological preparation for the implementation of intersubject communications in the course "Theory and Methods of Teaching Physics", in the curriculum of which 2 hours are allocated for the consideration of this issue. From these positions, the only way out is to address certain aspects of the implementation of intersubject communications when considering other issues. For example, an integrated lesson is considered as a form of organizing training in physics, within which systematization and generalization is interdisciplinary generalization. In addition, the analysis of sections and topics of the school physics course (a private methodology) must be associated with the establishment of intersubject communications, which will help orient future teachers in the implementation of intersubject communications. The most effective preparation for the implementation of interdisciplinary integration is provided when studying a special elective course, the main purpose of which is the formation of physics students' readiness for intersubject integration in the teaching of physics. It should be noted that significant techniques for establishing intersubject communications (teacher's story, conversation, systematization in the form of tables and diagrams, student messages, business games, etc.) contribute to the assimilation of integrable material by "building" into systems by systematizing based on the relationship of sciences. We suggest using two ways to integrate knowledge. The first method involves the transition from individual parts to their relationship, for which it is important to establish general concepts, the well-known fact of differences in

physical properties, for example, graphite and diamond (hardness, electrical conductivity) with the same chemical composition (carbon atoms), traditionally explained by the fact that diamond has a complex crystal lattice ("tetrahedron"), and graphite - a simple, "layered". A continuous three-dimensional network of covalent bonds, which is characterized by high strength, determines many properties of diamond (lack of conductivity, low heat conductivity, high hardness and refractoriness), and graphite has a hexagonal structure (atoms are located in separate layers formed from flat hexagons), as a result of which it has electrical conductivity, like metals [3].

So, the physical properties of carbon crystals are explained by the peculiarities of its chemical bonds, in this case the integrative approach allows us to show really the interpenetration of sciences. The second method involves a transition from the whole to the parts (an approach to solving many scientific and modern problems), based on system analysis, according to the scheme, starting with the allocation of the studied object in its integral properties and characteristics, the subsequent isolation of the object subsystem, which can be considered from the point of view different sciences, for example, the concept of "solutions": mentioned in the 7th (diffusion) and 10th (structure of matter and electrolysis) classes. It is most convenient to turn to this concept precisely in the study of electrolysis, to build a multilevel structure of the concept's connections (by isolating the knowledge subsystem). This is done with students during the conversation, the teacher can build the missing links, some connections are completed later, as they are discovered.

Using the above diagram, students plan to study the properties of the object from the standpoint of different disciplines. For example, considering the interconnected physical concepts of "heat transfer", "heat capacity", "evaporation", "energy absorption" and moving on to the manifestations of these processes in inanimate nature, we can easily come to conclusions about heat storage in a mild and continental climate, etc. (geography), recall the thermoregulation of living organisms, their adaptability to lack of water (biology).

At the same time, a picture of a holistic, interconnected, integrated world appears before students. The next step is to divide the subsystems into components with the definition of their properties, where a search conversation technique is used, a demonstration experiment (heating an electrolyte solution leads to an increase in its electrical conductivity, a physical fact explains the change in the transfer of substances through the cell membrane, the permeability of nerve impulses), a competition game (selected questions on the ability to establish intersubject communications), a conference, etc. As a result, internal and external relations of objects of each level (the third step) and determination of a specific type of relations are distinguished; correction of the primary hierarchy of objects (fourth step). The fifth step of system analysis involves the assessment of qualitative changes in a system object. In this example, upon completion of all studies, discussion of the collected and systematized information, the following is summarized: solutions can be considered from the point of view

of various sciences, since they have physical and chemical properties; these properties determine different processes in living matter and inanimate nature.

LITERATURE

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