

INFLUENCE OF INTERSUBJECT CONNECTIONS ON LEARNING EFFICIENCY

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ABSTRACT

The article presents the mutual influence of physics and other disciplines and the importance of the formation of inter subject connections for the formation of both basic and professional competencies. The emergence of cybernetics and the use of electronic computers radically changed mathematics, which, in turn, gave humanity a new layer of activity - computer science. The correct construction of the cognitive connection of these sciences by the teacher in the educational process is extremely important.

KEYWORDS: *Physics, Inter subject Connections, Competencies, Mathematics, Computer Science, Chemistry, Biology, Bionics, Ecology.*

INTRODUCTION

Physics is the foundational science of nature. The field of physics study encompasses both matter and energy, as well as the fundamental relationship of nature that governs the movement of matter. Each of the natural sciences (by which we mean chemistry, geography, biology, etc.) describes and studies only a certain class of objective systems. Physics can be called a fundamental science, due to the fact that the rest of the natural sciences obey its laws, and it, one way or another, connects them all.

The process of scientific progress is characterized by an ever-increasing connection and mutual influence of disciplines. In the last decade, bionics has greatly advanced, which uses physics, psychology, radio electronics, mathematics, biology, and other sciences with the aim of knowing living organisms to solve engineering problems.

The revolution in the scientific and technological world, which continues to this day, produces profound qualitative transformations in all areas of technology and science. The emergence of cybernetics and the use of electronic computers radically changed mathematics, which, in turn, gave humanity a new layer of activity - computer science. Advances in genetics led to a revolution in biology, and a revolution in chemical science contributed to the emergence of great chemistry. Similar changes are taking place in many other modern sciences.

Inter subject connections as a didactic category

The objective fact of the relationship between objects is also manifested in the process of teaching physics. This is due not only to the scientific principle, but also to the tasks that are set

for the educational program in physics in educational institutions. Only with a full understanding of the integrity and indissolubility of the natural sciences can an individual be formed who is oriented toward reason and objectivity. Therefore, intersubject communication was divided into two large groups: chronological and informational [1]. Each of which, in turn, is divided into three subgroups (Fig. 1).

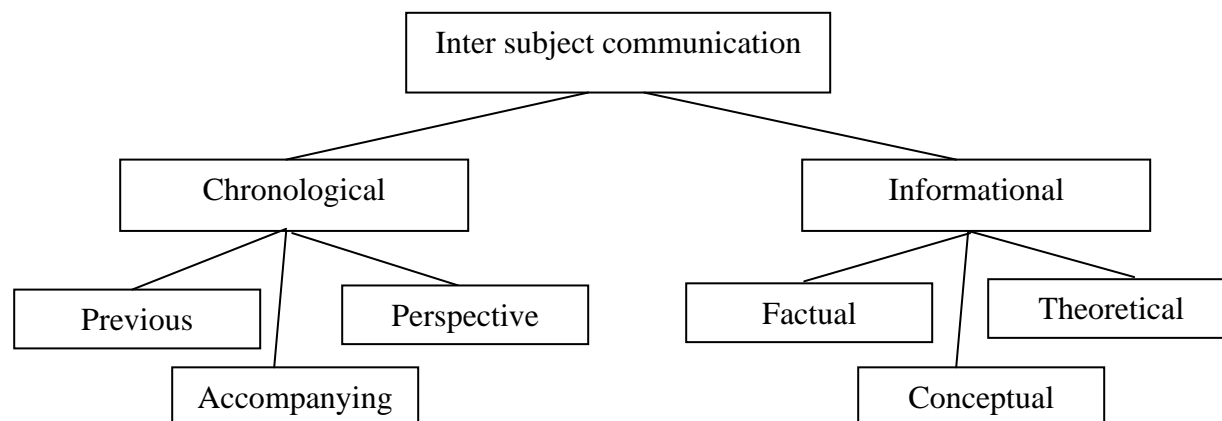


Fig. 1. Types of inter subject connections

Inter subject connections help:

- Chronologically order the conduct of educational complexes with the aim of their better assimilation by students;
- optimize the use of information that was obtained in the study of other subjects;
- eliminate repetitive material in curricula;
- To identify the commonality of techniques used in various disciplines (generalization of knowledge);
- To demonstrate the relationship of natural phenomena;
- To prepare students for the development of modern technology and permanently updated information;

Chronological links ensure consistent teaching of subjects over time, in accordance with the requirements of each discipline.

Informational connections are manifested in the unity of the interpretation of concepts, facts, provisions considered in the study of different subjects.

Ways of implementing intersubject connections:

- Implementation of information obtained in the study of parallel subjects;
- Execution of experimental works;
- carrying out complex excursions;
- reinforcing repetition.

The connection between teaching physics and mathematics

Physics has always had close ties with mathematics [2]. Mathematics is the language of physics. It is used to process the received data, to build theories. It makes it possible to better understand nature, to penetrate into its depths. Physics also noticeably influences the vector of development of mathematics.

The correct construction of the cognitive connection of these sciences by the teacher in the educational process is extremely important. When teaching students measuring skills and abilities, a physics teacher should take into account that already in elementary grades, students in mathematics lessons were given basic information about measurements of length, time, temperature, mass, about the division of the scale of measuring instruments, about the speed of movement and they are familiar with the metric system. Also, when conducting a lesson with students, we must rely on the foundation that was laid at school, and we are obliged to develop, strengthen it, expanding the student's worldview, forming a scientific approach to studying the physical picture of the world through mathematics. It is here that the competencies related to mathematics and computer science are formed.

The connection between teaching physics and chemistry

In physics and chemistry lessons, the same natural phenomena are studied from different sides [3]. All types of intersubject informational connections are manifested between them: both factual, and theoretical, and conceptual. Among the **conceptual links**, one can single out:

- substance, mass, weight, energy, molecule, atom;
- Fundamental laws: conservation and transformation of energy, conservation of electric charges.

Extremely important **theoretical** connections include theories: molecular-kinetic, and electronic, the theory of atomic structure, etc.

It is worth noting the **practical** skills gained in chemistry lessons: skills in operating laboratory instruments, methods of measurements and calculations, drawing up formulas. Complementary teaching methods help to strengthen knowledge: solving physical and chemical problems, organizing entertaining circles and evenings, making manuals that are necessary in the study of both chemistry and physics.

The connection between teaching physics and biology

The history of the interaction of physics and biology is old and rich. This connection has greatly strengthened in recent decades, which ultimately resulted in the birth of such sciences as agrophysics, biophysics, bionics, etc. The relationship between physics and biology can be viewed as the ratio of the general to the particular. The knowledge gained in biology lessons helps to strengthen knowledge about the principles of the physical laws and contributes to a deeper knowledge of the integrity of nature. This is also due to the consideration of issues related to the use of methods of physics in biology [4].

The relationship between physics and biology can be considered in three aspects:

1. Principles of physics observed in living organisms. In the lessons, examples are given that clearly show the work of physical laws on living organisms.

2. Bionics. An explanation is given of the origins of some modern technologies, "spied" on the principles that have been successfully implemented in the biological environment for many millions of years.
3. Ecology. Physical laws are related to the processes that occur in nature in connection with the production of man. And to eliminate the negative effects of such activities, to protect nature, you need to use the knowledge of the laws of physics.

Summarizing the above, we can draw the following conclusions: for the formation of a comprehensive developed individual, to whom both basic and professional competencies are inherent, it is necessary to form an understanding of intersubject connections. Knowledge of intersubject connections not only ensures high learning efficiency, but also forms and develops communication skills and work efficiency in any field of human activity.

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