



## INTER-SUBJECT CONNECTIONS IN BIOLOGY AND CHEMISTRY LESSONS

***Bekturganova Z.K.***

*Senior Lecturer at the Department of “Methods of Teaching Chemistry”  
Nukus State Pedagogical Institute*

**Tayanch soʻzlar:** shakllanish, dialektik-materialistik qarashlar, fanlararo aloqa, oʻquvchilar bilimining sifati.

**Ключевые слова:** формирование, диалектико-материалистические взгляды, межпредметная связь, качества знаний учащихся.

**Key words:** formation, dialectical-materialistic views, interdisciplinary communication, quality of students' knowledge.

### **РЕЗЮМЕ:**

Ушбу мақолада фанлараро боғлиқлик масалалари ўрганилган. Масалан биология ва кимё фанлари орасидаги боғлиқлиги мақолада батафсил ёритилган.

### **РЕЗЮМЕ:**

В данной статье исследуются вопросы междисциплинарности. Например, в статье подробно рассмотрена взаимосвязь биологии и химии.

### **SUMMARY:**

This article explores issues of interdisciplinarity. For example, the article examines in detail the relationship between biology and chemistry.

The formation of dialectical-materialistic views of nature among students is expressed in the function of methodology. The teaching methodology based on the connection between biology and chemistry develops the formation in students of modern ideas about its integrity and development, since interdisciplinary connections contribute to the reflection in teaching of the methodology of modern natural science, which develops through the integration of ideas and methods from the standpoint of a systematic approach to the knowledge of nature.

The interdisciplinary connection of the educational function is that with their help the biology teacher forms such qualities of students' knowledge as consistency, depth, awareness, and flexibility. These connections act as a



means of developing biological concepts and contribute to the assimilation of connections between them and general natural science concepts.

The interdisciplinary connection of the developmental function is determined by their role in the development of systematic and creative thinking of students, in the formation of their cognitive activity, independence and interest in learning about nature.

The interdisciplinary connection of the educational function is expressed in their assistance to all areas of education of schoolchildren in teaching biology. The biology teacher, relying on connections with other subjects, implements an integrated approach to education.

The interdisciplinary connection of the constructive function is that with their help the biology teacher improves the content of educational material, methods and forms of organizing teaching. The implementation of interdisciplinary connections requires joint planning by teachers of natural science subjects of complex forms of educational and extracurricular work, which presuppose their knowledge of textbooks and programs of related subjects.

The set of functions of interdisciplinary connections is realized in the learning process when the biology teacher implements all the variety of their types. There are intra-cycle connections (connections between biology and physics, chemistry) and inter-cycle connections (connections between biology and history, labor training).

Actual interdisciplinary connections are the establishment of similarities of facts, the use of general facts studied in courses in physics, chemistry, biology, and their comprehensive consideration in order to generalize knowledge about individual phenomena, processes and objects of nature. Thus, in teaching biology and chemistry, teachers can use data on the chemical composition of the human body.

In practice, teachers often use integrated lessons. In the article we will consider the issues of integration in learning, the possibility of using and conducting integrated lessons, reflecting interdisciplinary connections in biology and chemistry in a modern school.

Problems of integration are relevant in education, due to objective views in the modern world and dictated by new requirements for school. One of the problems of the modern school is the orientation of the subject education system towards the private acquisition of knowledge in a particular area that is poorly connected with each other. A student, receiving a certain amount of information on individual subjects, cannot always analyze; capture the connection between phenomena; quickly find the right solution. The main reason is that



in a comprehensive school traditionally attention is paid to the accumulation of knowledge, but modern education directs all efforts to preparing a highly educated, intellectually developed person with a holistic view of the world. A single, holistic picture of the world can be presented by an integrated approach to education, which allows the teacher to expand the boundaries of the subject matter, help the student in finding solutions to problems, using all knowledge that goes beyond the scope of a particular subject. [1].

A lesson reflecting interdisciplinary connections is a lesson, the goal of which can be achieved only by combining knowledge from different subjects, aimed at considering and solving any boundary problem, allowing students to achieve a holistic perception of the topic being studied, harmoniously combining interdisciplinary connections, having practical direction.

Integrated learning considers a variety of interdisciplinary problems that expand the scope of existing programs and textbooks for secondary schools. This approach combines a variety of teaching methods: lecture and conversation, explanation and management of students' independent work, observation and experience, comparison, analysis and synthesis; a large place is given to teaching methods using computer models, the use of information and communication technologies and the heuristic method [2].

In practice, you can often find the same concept, which is defined differently within each specific subject - such polysemy of scientific terms hinders the perception of educational material. Inconsistency in curricula leads to different learning times for the same topic in different subjects. These contradictions are easy to overcome with integrated learning, which solves another problem - saving teaching time.

When conducting integrated biology lessons, students should develop knowledge about nature as a unified system in which all its elements interact, preserving the need for biophysical and biochemical processes of life on Earth. To form the concept of a single world picture, in the lesson it is necessary to expand on the concept of "nature-man-society". As a result, not only intra-subject connections are established, but also the integration of material from other subjects (chemistry, geography, physics). As a result, interdisciplinary connections arise that give students knowledge of many areas of science, art, as well as real everyday life.

When studying in biology lessons in the 9th grade the structure and composition of a cell on the topic "Structural organization of a living cell," students learn that the cell has a complex structure, is an elementary unit of structure and vital activity of all organisms (except viruses), has its own



metabolism, and is capable of independent existence, self-reproduction and development. All living organisms are either, like multicellular animals, plants and fungi, composed of many cells, or, like many protozoa and bacteria, are single-celled organisms [5].

When studying the physiological processes occurring in a cell (nutrition, respiration, growth, division and excretion), students gain an understanding of the unity of processes characteristic of both an individual cell and a multicellular organism. When studying the chemical composition of a cell, students become acquainted with macro- and microelements - chemical elements of D. I. Mendeleev's Periodic Table of Chemical Elements, establishing an interdisciplinary connection between biology and chemistry.

When conducting integrated lessons "Structural organization of a living cell", it is possible to use various methods of applying knowledge from other subjects: the use of visual aids (tables, instruments, chemicals), homework to repeat material from another subject. For example, when studying the chemical composition, functions of cells and the body, metabolism, the tables "Water" and "Oxygen and Nitrogen" contribute to the activation of students' thinking and interest. All this helps answer interdisciplinary questions [3].

Our school provides integrated lessons in various subjects. We have developed and implemented integrated lessons in chemistry and biology. An example is the presence in the 10th grade chemistry course of the topic "Organic compounds: proteins, fats, carbohydrates," which are interconnected with the general biology course studied in the 10th grade "Molecular level: proteins, fats, carbohydrates." During the lesson, students consider not only the structure, functions and properties of organic compounds, but also their chemical properties (an example is performing an experiment: determination of glucose by silver mirror reaction; protein - concentrated nitric acid; vegetable oil - with a solution of potassium permanganate), atomic composition, chemical bonds occurring in molecules, primary, secondary and tertiary structures (if they are characteristic of a given compound), calculate the energy value of food products. The objective of this lesson is to consolidate information about the composition, structure, properties and functions of high-molecular organic compounds of fats, proteins and carbohydrates; show, using knowledge of chemistry and biology about proteins, fats and carbohydrates, that human health is the main value of life, which must be preserved and protected from school age. Conducting an integrated lesson "Organic compounds: proteins, fats and carbohydrates" helps to generalize students' knowledge in chemistry and biology and preserve human health. The organization of problem-based



research training contributes to the formation of creative and research abilities through the use of interdisciplinary tasks that contribute to the formation of experience in chemical creativity [6].

Work on the students' development is of particular importance and is the foundation for the further formation of the student's personality. Everything that is laid down to students determines the success and the forming process level a person's personality, his worldview, and his development for many years to come. The qualities, knowledge, abilities and skills acquired at school provide not only the basis for further education and upbringing of a teenager or young man at school or in another educational institution, but also largely determine the practical, social and professional activities qualities of an adult. One of the factors in the intellectual sphere study of schoolchildren is the problem learning phenomenon. Depending on the goal, on the task of the school, teaching can be problematic and not problematic. If the school is given the task of developing students' thinking and their creative abilities, then pedagogically correctly organized teaching cannot but be problematic.

Thus, the use of an integrated approach is an effective means of developing students' ability to generalize material. Integrated training makes it possible to most effectively demonstrate interdisciplinary connections and the natural scientific research method used at the intersection of sciences. Also, combining all the positive aspects, we can conclude that the integration of objects allows you to use not only the content of the objects themselves, but also apply the knowledge of other various fields of science, culture, art, as well as refer to the phenomena and events of the surrounding life [4], [5].

Teacher's good didactic preparation is especially important today, because without knowledge of general theory it is impossible to create, and the teaching process itself is an art, an art to captivate children with their subject, to surprise with the thought, knowledge beauty, and to induce independent mental actions. Our schools task is to form a harmoniously developed personality. The most important indicator of a comprehensively and harmoniously developed personality is the presence of a high level of thinking ability. Teaching, in which the teacher, relying on knowledge of the patterns of thinking development, with special pedagogical means, conducts purposeful work to form the thinking abilities and cognitive needs of his students, is problematic. Understanding the problematicity essence as cognition regularity, defining its role in learning and introducing - the problematicity principle concept into didactics opened up new opportunities for a theoretical explanation of the way to enhance the educational and cognitive activity of students. [3]



In the conclusion of this article, we can single out the goal of activation through problem learning is to understand the level of assimilation of concepts and to teach not individual mental operations in a random, spontaneously evolving order, but a system of mental actions for solving non-stereotyped tasks. This activity consists in the fact that the student, analyzing, comparing, synthesizing, generalizing, concretizing factual material, himself received new information from it. In other words, this is an extension of the deepening of knowledge with the help of previously acquired knowledge or a new application of previous knowledge.

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