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INTERDISCIPLINARY CONNECTIONS IN SCHOOL COURSES PHYSICS AND CHEMISTRY

Abstract: In the article the establishment of intersubject communications at studying of a program material for chemistry and physics based on the subjects of chemistry (author O. S. Gabrielyan, G. G. Lysova) and physics (authors: G. Y. Myakishev, B. B. Bukhovtsev and Peryshkina A. V.) Interdisciplinary connections of subjects of chemistry and physics can help the teacher to diversify and expand both theoretical and practical components of the lesson in achieving desired learning outcomes at various levels of education.

Key words: physics, chemistry, interdisciplinary connections

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Introduction

Interdisciplinary connections between academic subjects are dictated by the didactic principles of teaching, educational objectives of the school, the connection of education with life, preparing students for practical efficiency.

Interdisciplinary connections in the school learning is a concrete expression of the separation of the actions that are happening now in science and in the community. These relationships play a key role in improving practical and theoretical education of students, a significant personality which is the assimilation of the generalized nature of the cognitive efficiency.

In pedagogical literature there are 30 definitions of the category of "interdisciplinary connections", is the most different approaches to their teaching assessment and different classifications.

So, group creators describes interdisciplinary connections to be considered as a didactic limitation. It is noted that interdisciplinary relations play the role of a didactic factor of increase of efficiency of educational process (F. P. Sokolova); interdisciplinary communication as a didactic constraint that enforces consistent mapping in the content of school science disciplines, impartial relationships working in nature (V. N. Fedorov, M. D. Kiryushkin).

Consider the researcher interdisciplinary connections, as the links that appear in the course,

built upon its logical structure, characteristics, opinions disclosed on the lessons of other disciplines", as displaying the content of training courses those dialectical relationships, which are impartial in nature and are known by modern science.

Verify that the implementation of interdisciplinary relations contributes to the renewal of the students' single view of the phenomena of nature and the relationship between them, and therefore makes knowledge important and applicable. Interdisciplinary connections allow you to apply skills which students received on the previously studied items applying them, both academically and in extracurricular activities, production and research.

The relevance of interdisciplinary relations in schooling is obvious. It is due to the modern level of development of science, which clearly set the connection public, scientific and technical knowledge. The fusion of scientific knowledge, in its order, placing the newest queries to the experts. The growing role of knowledge, studying in the field related with expertise, science and skills unit to use them while solving different tasks.

Conducting interdisciplinary connections in practice raises many challenges: how to identify cognitive activity of students, that they wanted and were able to make connections between various school subjects how to determine their cognitive



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enthusiasm for philosophical questions of science; how to combine the aspirations of the teachers of the various disciplines in acquiring the educational effect of the training?

The study of similar questions in physics allows students to realize the acquired knowledge and experiment deeply study concepts, phenomena and processes.

The aim of our study was to reveal the way to establish interdisciplinary connections in the study of program material for chemistry and physics based on the subjects of chemistry (author O. S. Gabrielyan, G. G. Lysova) and physics (authors: G. Y. Myakishev, B. B. Bukhovtsev and Peryshkina A. V.)

Tasks:

- Study of print and online resources for interdisciplinary connections of physics and chemistry as well as their use to improve motivation.
- Analysis of programmes in physics and chemistry to establish relationships between their content.
- Synthesis of the experience in the use of interdisciplinary connections and their influence on the motivation of students.

Training programme on physics and chemistry teachers require the solution of a single task:

- formation of the dialectical materialist mirovozreniya students, their faithful representations of the modern world picture;
- education of students in the learning process of basic Sciences on the nature, formation of careful attitude to its protection;
- formation abderemane skills in those activities that are common to data items (educational, cognitive, experimental, practical, calculation and measuring, etc.);
- the Polytechnic education students.

Execution of these tasks is based on the similarity of physics and chemistry that are United by a common methodology and methods of knowledge (physical and chemical methods of observation, the language of terms, symbols,

formulas, single units); a single set of problems (conservation, sustainable use of its resources, space exploration, global ocean, energy, etc.); uses of technical knowledge in modern production.

The relationship of the courses of physics, chemistry presents the key relationships of different forms of matter in motion that exists in nature.

Physics and chemistry has the General methodological idea is that the laws and attitudes (of conservation of matter and energy, periodicity, relativity, causality, consistency, symmetry).

The theoretical analysis allowed to identify the main directions of realization of intersubject links of physics and chemistry:

- establishment and development of the concepts of substance in the study of physical properties and structure;
- study of the theories and laws that are common to physics and chemistry; the study of the essence physico-chemical phenomena;
- familiarity with the structure and principles of operation of technological equipment;
- use in physics classes of chemical concepts, the same values and units of measurement and Vice versa;
- overview of the possibilities for securing fundamental laws and theories of science to explain the phenomena;
- formation of ideas about the circulation of elements, substances and energy.

Interdisciplinary connections arise in the learning process as a limitation of the implementation of its main functions(educational, developmental, and educational), and perform methodological, constructive and formative functions. In accordance with various functional value changes of their content and meaning.

The analysis of the experiences of teachers of physics and chemistry allowed to identify interdisciplinary tasks and to organize independent activities of students using different types of materials: print-based, digital resources.

Table 1
Characteristics of interdisciplinary relations of school courses of chemistry and physics.

Class	The topics of the physics course	Interdisciplinary connections with chemistry.
Grade 7	Of the physical body. The physical phenomena. Measurement of physical quantities and their units. Measuring instruments. The discrete structure of matter. Molecules. Atoms. Solid, liquid, gaseous States of matter. The density of the substance. The pressure of gases and liquids. Measurement of atmospheric pressure	Prospective interdisciplinary connections Chemistry 8th grade. Basic concepts of chemistry (physical phenomenon, body, substance, atom, molecule, molecular, and amolecular structure of matter, mass) solutions. Chemistry 9 class. Metals (solid, liquid, gaseous States of matter).

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Class	The topics of the physics course	Interdisciplinary connections with chemistry.
Grade 8	Internal energy. The calculation of the amount of heat when heating and cooling from the combustion of fuel. Melting and crystallization. Boiling liquids. Electric phenomena.	Previous interdisciplinary connections Chemistry, 8th grade. The structure of the atom and systematization of chemical elements (the structure of the atom, nuclide, isotopes, orbital, electron layer, the valence electrons) (1st quarter). Chemistry, 8th grade. Solutions. Prospective interdisciplinary connections. Chemistry 9 class. Metals (melting, crystallization of substance, the melting point of the metals).
Grade 9	Basics of kinematics. Graphical representation of motion. The basics of dynamics. The conservation laws. Oscillations and waves. Electromagnetic phenomena. The structure of the atom and atomic nucleus.	Previous interdisciplinary connections Chemistry 8, 9 class. The structure of the atom and the periodic law (isotopes, phenomenon of radioactivity, the physical meaning of the atomic number of a chemical element, period number and group number).
Grade 10	Fundamentals of molecular-kinetic theory. Fundamentals of thermodynamics. Structure and properties of solids and liquids. Humidity. Electric and magnetic fields. Potential. Electromagnetic induction. Electric current in metals and electrolytes.	Previous interdisciplinary connections Chemistry 8, 9 class. The structure of the atom and the periodic law. Chemistry 8, 9 class. Basic concepts and laws of chemistry (mole of the substance, amount of substance, molar mass, Avogadro's number, etc.) Chemical bond (covalent, ionic and metallic bond, intermolecular interactions, dipole, molecular and amolecular structure of matter, atomic, molecular, ionic and metallic crystals) Solutions (electrolytes, non-electrolytes, anion, cation, ion reaction). Metals: electronic structure of atoms, metals, metal crystal, the physical and chemical properties of metals.
Grade 11	Electromagnetic waves and their properties. The production and transmission of electric power. Optics. The law of interrelation of mass and energy. The photoelectric effect. Photon. The nuclear model of the atom. Quantum postulates of Bohr. The proton-neutron model of the structure of the nucleus of an atom. The nuclear reaction. Radioactivity. Ionizing radiation.	Previous interdisciplinary connections Chemistry, 11 class. The structure of the atom and the periodic law (nuclides, isotopes, phenomenon of radioactivity, the physical meaning of the atomic number of a chemical element, period number and group number). The chemical bond and the structure of matter. Chemical reactions (thermal effects of chemical reactions, reactions, exothermic and endothermic).

Due to the interdisciplinary connections students will get key ideas of the school subjects that provides for the development of General techniques for their study. This forms a single scientific system of knowledge based on awareness, compactness and strength of the Outlook.

Analysis of the experience of teachers of physics and chemistry showed that the introduction of interdisciplinary cognitive tasks in the form of

problem questions, quantitative problems, practical exercises allowed the trainees.

Resaw tasks making complex cognitive and computational actions by:

- understanding the essence of interdisciplinary tasks, the understanding of the need to apply knowledge from other subjects;
- selection and their actualization need knowledge of other objects;

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• transfer into a new situation, a mapping of knowledge from related subjects;

• knowledge synthesis, assessment of the compatibility of concepts, units of measurement, the calculated actions, their implementation;

• get the result, generalization of the findings, reinforcement of concepts.

The analysis of the textbooks allows you to note that there is no developed system of interdisciplinary connections of physics and chemistry. Existing curricula and textbooks do not implement the issue raised.

When developing lesson plans, the teacher should know what students already received the information, the lessons in other subjects, and, therefore, require correction, clarification of

questions and tasks with teachers (particularly physics and chemistry) in related disciplines in the setting of questions and tasks to avoid duplication and achieve common development of ideas and concepts, their deepening and enrichment. This helps the peer-reviewed lessons and study of writing teachers working programs implemented intra - and interdisciplinary connections.

Conclusions

In modern conditions the implementation of interdisciplinary connections is very problematic in the context of the curriculum and textbooks. Remains fundamentally hoped for educators who deeply understand the similarity of nature and support interest in the study of chemistry and physics..

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