

# The Importance of Using the Integration of Chemistry with Natural Sciences in Improving Students' Professional Competence

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**Abstract:** In this scientific article, we will talk about the fact that chemistry, which is part of the natural sciences, in an unusual way combines an interesting and integrative lesson with both exact and natural sciences, which simultaneously involves all brain cells. This article examines in detail the work of scientists so far and the true significance of these works.

**Keywords:** Integration, trend, paradigm, communicative and motivational components, professional competence, reflexivity and creativity, diagnostic and analytical, functional and structural, morphological, genetic, innovative technologies, complex, integration, individual approaches, motivational, cognitive, reflexivity, dynamic system.

**Introduction:** Using the integration of chemistry with natural sciences helps greatly to improve the professional competence of students. This process allows students to understand the subjects as a whole, see their interrelationships and apply their scientific knowledge in practical life. Here are some key points:

**Deepening Knowledge:** Integration helps students see the connections between different subjects and explore them more deeply. For example, integrating chemistry and biology can help students better understand the chemical processes taking place in organisms.

**Improving problem solving ability:** By integrating natural sciences, students learn to apply different approaches to solving complex problems. This will greatly help them in their future professional careers.

**Practical Skills Development:** Integration with chemistry and other natural sciences allows students to develop practical skills by doing laboratory work and conducting experiments.

**Creation and Innovation:** Through the integration process, students develop creativity and innovative thinking skills while conducting research and innovation.

**Motivation and interest:** The integration of natural sciences shows students interdisciplinarity and increases their interest. This will increase their motivation to study.

The integration of chemistry and natural sciences plays a fundamental role in the application of scientific knowledge in practical life and provides a solid foundation for the success of students in their future professional activities.

**Formation of professional skills.** The combination of chemistry and natural sciences provides students with the following professional competencies:

Develops skills in analyzing and conducting experiments through laboratory experiments.

It provides an opportunity to study and put into practice the principles of environmental safety and sustainable development.

The integration of natural sciences is the process of studying various natural sciences, such as biology, chemistry, physics, and geography, by combining them. This approach contributes to the expansion of scientific knowledge and a better understanding of complex issues through the development of interdisciplinary connections. Here are some examples of the

integration of natural sciences:

Ecology and Environmental Science-this field combines various aspects of biology, chemistry, and geography. For example, in the process of studying ecosystems, the chemical composition, physical environment, and biological diversity of the components are studied together.

Integration with biology: The study of biochemical processes and chemical reactions in living organisms shows students the importance of chemistry in biology and broadens their horizons. Examples are photosynthesis, respiration, and enzyme chemistry.

Biochemistry-biochemistry studies the chemical processes of life and is located on the border of biology and chemistry.

Geophysics studies the physical properties and processes of the Earth, combining physical and geographical sciences.

Integration with ecology: The study of chemical issues related to environmental protection (e.g. pollution, global warming) teaches students the practical importance of chemistry and a sense of responsibility.

The integration of natural sciences makes it possible to combine the teaching of subjects both at school and in higher education institutions. This approach helps students better understand complex issues and deepens their knowledge.

The scientific research of Nadezhda Mikhailovna Slautina, Anatoly Alexandrovich Irincheev, Ekaterina Alexandrovna Sadovskaya, and Tatyana Petrovna Lapeko can be mentioned about the formation of the professional competence of future teachers in developed countries and their scientific solutions.

In her scientific research, Slautina Nadezhda Mikhailovna considered the formation of professional qualifications of students of higher educational institutions as an independent task. This means that in his research he focuses on the implementation of a competence-based approach to the content of vocational education programs, the choice of appropriate technologies and the organization of student activities. The main idea of the study was to substantiate and verify how the process of student training at a modern university changes the formation of professional competence in accordance with the trends and prospects of the development of the world community and the higher education system [1]. The purpose of the study and the hypothesis put forward led to the solution of the following tasks:

Systematization of trends and prospects of university students' training and identification of opportunities for using a competence-based approach in the

preparation of their students. The process of concretization and implementation of pedagogical conditions for the formation of professional competence of university students is highlighted. Development of scientific and methodological recommendations for the formation of professional qualifications of university students [1; 116-137-b].

Anatoly Alexandrovich Irincheev in his scientific research is aimed at developing the professional competence of future teachers, in which the actual problem of research is awareness of the problem of inconsistency of the modern level of professional qualifications of teachers with modern methods of pedagogical activity and professional training of future teachers. [2].

The scientific novelty of the research: a personality-developing approach to teacher training has been introduced;

the methods of choosing the content of education, as well as the implementation of its structure, are determined, corresponding to the competence paradigm of pedagogical education;

the harmonization of professional pedagogical knowledge and skills is ensured;

creative, reflexive, communicative and motivational components are provided in the structure of the teacher's professional competence, conditions for their development are created, the need for constant professional self-improvement is formed [2].

The scientific novelty of Ekaterina Alexandrovna Sadovskaya's scientific research aimed at developing the professional competence of future professors: the concept of professional competence of future university professors was defined as an integral personality trait based on the unity of knowledge, relationships, and skills [3].

Tatyana Petrovna Lapeko's research work is aimed at developing the professional skills of a teacher in solving pedagogical problems. Definition of the essence of a teacher's professional competence in solving pedagogical problems in scientific research;

definition of the content and structure of the teacher's professional competence development in solving pedagogical tasks;

identification of a sufficient hierarchy of pedagogical tasks for the development of a teacher's professional skills in solving them;

identification of psychological and pedagogical conditions of his development;

The task was set to develop an experimental methodology for the development of a teacher's

professional competence in solving pedagogical tasks, to test and analyze its effectiveness, all these tasks were completed and reflected in the scientific novelty of the study [4].

Several research papers from developed countries on the use of subject integration in chemistry teaching and the formation of professional competencies of future chemistry teachers were analyzed.

In particular, the scientific research of Maxim Anatolyevich Shatalov is aimed at using the integration of disciplines in teaching chemistry in secondary schools, and the scientific novelty of the research lies in:

For the first time, the concept of problem-based integrative chemistry teaching was proposed and substantiated. For the first time, a theoretical model of chemistry based on interdisciplinary integration and its methodological system has been developed and implemented. The conditions of their implementation are highlighted. The issues of interconnection and integration in chemistry and MPS - as an integration mechanism - were studied in a holistic system [5].

T.A. Borovsky's scientific research focuses on the use of integrated technologies in teaching chemistry in secondary schools, as well as on the individualization of chemistry teaching based on modern educational technologies [6, 7]. In his scientific research, Alexey Anatolyevich Zhurin devotes himself to combining media education with a secondary school chemistry course. The researcher developed a technology for combining media education with a chemistry course using both theoretical and empirical methods.:

analysis (state educational standards and their projects, curricula, textbooks and other means of teaching chemistry, work on didactics and private methods of mass media communication, etc.), modeling and design (individual teaching tools, their complexes and systems), observation (in chemistry lessons and extracurricular activities on the subject), The ideas about interviews and questionnaires (of teachers, students, parents), natural pedagogical experience, and an expert assessment method are given. In the process of experimental work, empirical (pedagogical experiment, observation, monitoring, questioning) and theoretical methods (analysis, synthesis, abstraction, idealization) were combined [8].

The scientific novelty of the study lies in the fact that for the first time:

1) a new scientific idea is proposed on the need to integrate the mass media and the traditional system of teaching tools in order to form the foundations of natural sciences, information culture and a modern

worldview based on the integrity of knowledge among schoolchildren.;

2) the scientific concept of integrating media education with a chemistry course has been developed, on the basis of which a methodological system has been built, including conditions, goals, content, means, forms of education and principles of integration.;

3) the positive impact of the introduction of media education elements on the strength and awareness of students about chemistry and the effectiveness of media education in the process of teaching the basics of chemistry has been proven [8].

He has prepared new didactic developments for the system of teaching tools that improve the level of chemical education of schoolchildren and integrate media education with the chemistry course and combine traditional teaching tools (printed notebooks, sets of tasks and exercises, demo tables) with new generation tools (CDs for educational purposes) [8].

The technology of integrating media education with a secondary school chemistry course is based on the integrated use of a system of dual learning tools, which is prepared taking into account the dual analysis of educational information (content and form of information).

Okolnikov Fyodor Borisovich carried out research work on the methodology of using the integration of chemical and biological sciences in consolidating the experimental chemical skills of students. The main content of the research is aimed at finding ways to increase students' motivation to study chemistry by integrating experimental chemical skills using previous biology training. The hypothesis of the study was that by regularly offering integrated laboratory work related to biology to schoolchildren in chemistry lessons in the eighth grade as part of the practical part of the chemistry course, it can be expected that a significant part of students will have a positive motivation for chemistry lessons [9].

Research in the field of interdisciplinary relations and integration of academic disciplines of the natural science cycle into the educational school (V. N. Maksimova [10], I. D. Zverev [11, 12], V. N. Fedorova [13], A. B. Usova [14], etc.).

The research work of gilmanshina Suriya irekovna is aimed at shaping the professional thinking of future teachers based on a competence-based approach.

The scientific novelty of the study lies in the fact that the following results were obtained for the first time. The concept of a competence approach has been developed, which involves considering professional thinking as a competence for the formation of

personality, quality and the basic system of a teacher and disclosing it taking into account the main features of pedagogical activity. The competence-based approach made it possible to scientifically substantiate the essence and specifics of the professional thinking of a natural sciences teacher in an integrated system of hierarchically interrelated concepts, his models by categories of pedagogical activity, as well as the methodology of formation [15].

Elizaveta Borunova has developed a methodology for studying chemistry at school in terms of integration with the English language. Another important reason for the development of this particular problem is the change in the personality of the most modern student. Currently, most schoolchildren are active users of the global Internet, which requires research on the formation of the foundations of media education, including skills and experience in communicating and using information in different languages. The theoretical significance of the research lies in the fact that it provides a comparative assessment of modern domestic and foreign experience in the implementation of the educational process using interdisciplinary integration of disciplines of the chemical and humanitarian cycle, in particular a foreign language; a conceptual model of educational work in chemistry in the context of integration with the English language has been developed [16].

Integrated teaching of chemistry and natural sciences strengthens students' knowledge, enhances their professional competence and helps them achieve success in the labor market in accordance with the requirements of modern science and technology.

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