

# Pedagogical and Psychological Aspects of Using the Integration of Chemistry with Exact and Natural Sciences in Education

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**Abstract:** This article examines the relationship of chemistry with several humanities and social sciences, the advantages of integrated teaching methods, conclusions from the research works of scientists from the CIS countries, the evolutionary development as a result of innovative training of future teachers and how a lesson can help reduce stress, how to connect chemistry with art through restoration.

**Keywords:** Psychological aspects, pedagogical aspects, interdisciplinary approach, periodic table, emotional abilities, innovations, neurochemistry, pharmacology, toxicology, evolutionary psychology, cognitive abilities.

**Introduction:** Integrated lessons are an important part of the interdisciplinary communication system. Each of these lessons is taught by two or more science teachers. The material of such lessons shows the unity of the processes taking place in the world around us, and allows students to see the interrelationship of various disciplines.

The pedagogical and psychological aspects of using humanities (history, philology, art and culture, philosophy) disciplines in chemistry teaching are important, as this approach enriches students' knowledge not only scientifically, but also socially, culturally and personally. Humanities (history, literature, philosophy, art, psychology, etc.) introduce new approaches to the process of teaching chemistry and increase the interest of students. The following are the pedagogical and psychological aspects of this approach:

Pedagogical aspects.

1. Developing an interdisciplinary approach: The humanities encourage an interdisciplinary approach to chemistry teaching. This gives students the opportunity to understand their chemistry knowledge in a historical, cultural and social context. For example, students' knowledge is deepened by providing information about the history of chemistry, chemical discoveries and their impact on society[1].

2. Make lessons interesting and viable: Thanks to the humanities, chemistry lessons can be interesting and viable. For example, images of chemical phenomena or substances in literary works, stories about the contribution of historical figures to chemistry. This will attract the attention of students and increase their interest in the lesson.

3. Historical and cultural context inclusion: students' knowledge is expanded by explaining the historical and cultural significance of chemical discoveries. For example, the periodic table of Mendeleev or data on the development of chemistry in ancient times. This gives students an idea of the role of chemistry in the history of mankind.

4. Discussion of social and ethical issues: Increasing students' social responsibility by discussing the social and ethical aspects of chemistry (for example, chemical weapons, substances harmful to the environment). He teaches students to think critically and make moral decisions.

5. Development of language and communication skills: With the help of humanities, students' language and communication skills can be developed. For example, writing essays on chemistry topics, conducting discussions, or analyzing scientific articles. This increases their ability to express their knowledge and communicate[2].

Psychological aspects.

1. Increasing Students' motivation: Increasing interest in chemistry lessons through the humanities increases students' motivation. This will increase their interest and engagement in the lesson. For example, combining chemistry and art, stories about the chemistry of color or the use of substances in the visual arts.
2. Promoting personal development: The humanities contribute to the personal development of students. In chemistry lessons, you can form your personal values by discussing philosophical approaches, ethical issues, and social issues. This helps them grow into socially and morally mature people.
3. Development of emotional and creative abilities: Humanities help to develop students' emotional and creative abilities. For example, writing poetry on chemistry topics, creating works of art, or artistically describing chemical processes. This increases their ability to think creatively[3].
4. Encourage critical thinking: Students' ability to think critically can be improved through the humanities. For example, discussing the social consequences of chemical discoveries or environmental issues. This increases their ability to analyze complex problems and find solutions.
5. Stress reduction and improved learning environment: With the help of humanities, chemistry lessons can be made less rigorous and exciting. This reduces student stress and creates a comfortable learning environment for them.

Practical examples.

1. Chemistry and History: the historical significance of chemical discoveries (for example, the discovery of explosives or medicines).
2. Chemistry and art: chemistry of color, the use of substances in the visual arts.
3. Chemistry and Philosophy: the nature of scientific knowledge and the ethical aspects of chemical discoveries.

The use of humanities in chemistry teaching is an important tool for expanding students' knowledge, increasing their interest, and promoting personal development. This approach helps students to become mature people not only scientifically, but also socially, culturally and morally[4].

The integration of chemical and philological sciences is a very interesting and extensive topic. The merging of these two areas opens up different possibilities and new approaches. For example: new terminologies and concepts are being created in the field of chemistry, and philology helps to correctly translate, define, and

communicate these terminologies to the general public. Chemistry and philology can be taught together in academic programs. This helps students to develop not only scientific knowledge, but also the skills of their correct expression and presentation. When writing scientific literature and articles, philologists ensure the correct use of scientific terminology, clear and meaningful expression. Thanks to these opportunities, the integration of chemical and philological sciences not only expands scientific knowledge, but can also be useful from a cultural and social point of view[5].

The connection of chemistry with art and cultural studies is actually an all-encompassing topic. Exploring these two areas together can provide different opportunities and new perspectives. For example,

Chemical Pigments and dyes: The colors used in works of art are made based on chemicals. Thanks to advanced chemical technologies, new colors and materials are created, which are used to create works of art.

Conservation and restoration: In cultural studies, chemistry plays an important role in the process of preserving and restoring artifacts. For example, ancient inscriptions, ceramics, and paintings can be restored and preserved using chemicals and methods[6].

Scientific visualization: The visualization of scientific research and results in chemistry is carried out through art and design. Here is an art to show chemical structures and reactions in a beautiful and precise way, and graphics are used. Thanks to these areas, the relationship between chemistry and art, as well as cultural studies, becomes richer and more perfect.

The relationship between chemistry and philosophical sciences occupies an important place in scientific, legal, spiritual and metaphysical issues. The integration of these two fields involved various issues, some examples include:

Scientific Methodologies: Chemistry and philosophy develop and apply different methodologies in science research. While philosophy analyzes the basic principles of science, chemistry explores and programs these principles from a practical point of view.[7]

Concepts and symbols: Metaphors and symbols are used in chemistry and philosophical sciences. Elements and reactions in chemistry have philosophical significance and can provide a broader understanding of the nature of the world and man. Through these connections, chemistry and philosophy complement each other, contributing to a broader and deeper understanding of science and spirituality.

The pedagogical and psychological aspects of using the integration of social sciences in chemistry teaching

contribute to the expansion of students' knowledge, skills and worldview. This approach increases students' motivation by empowering them to better understand and apply science in practice through community-related chemistry teaching.

Pedagogical aspects:

a) Increasing student interest: The relationship between chemistry and social sciences allows students to connect science with life processes. For example, the integration of chemistry and geography, as well as historical sciences, can be effective on the topics of ecology and environmental protection.

b) Develop systematic and analytical thinking: by combining chemistry and economic knowledge, students can better understand production processes, the impact of chemical products on the economy, and concepts of sustainable development.

c) the use of interactive teaching methods: when teaching chemistry in combination with social sciences, deeper learning of subjects is ensured through project work, role-playing games, problem-based learning and discussions.

Psychological aspects:

a) individual approach to learning subjects

The level of understanding of science is enhanced through interdisciplinary integration, taking into account the psychological characteristics of each student. For example, students with a strong interest in social sciences also begin to study chemistry better[8].

b) formation of critical and creative thinking: by discussing the impact of chemical processes on social life, students develop critical thinking and analytical skills.

c) Emotional and intellectual development: the integration of chemistry and social sciences encourages students to be socially responsible. For example, by carrying out project work to solve environmental problems, they develop their emotional and intellectual abilities[9].

Integrating chemistry with the science of sociology: The integration of chemistry and sociology offers multifaceted and interesting opportunities. By understanding the relationship between these two areas, it is possible to better understand and solve various problems in society. Let's look at some directions.:

Public Health and Ecology: Chemical sciences help explain the relationship between humans and the environment through environmental and public health research. Sociology, on the other hand, studies the social consequences of these studies and their impact

on people's lives[10].

Industry and Manufacturing: Analyzes the impact of the chemical industry and manufacturing on society and the workforce in combination with sociology. For example, issues of working conditions, health and safety in industry can be studied using chemistry and sociology.

Technology and Innovation: Chemistry and sociology analyze the social consequences of innovation and technology. Information is being collected on how innovations and technologies affect people's lives and social structures[11].

Chemistry and Sociology help students improve their understanding of science and social issues through collaborative learning. The interconnected teaching of these subjects makes it possible to expand people's understanding. Thanks to these fields of science, chemistry and sociology complement each other, helping us to better understand and solve various problems in society.

Integration of chemistry with psychology.

The integration of chemistry and psychology can further enrich our understanding of the human mind and behavior. The connection between these two areas stems from different aspects. For example, neurochemistry, pharmacology, Toxicology, and evolutionary psychology. Psychology and chemistry combine to understand the process of human evolutionary development. This field studies how the human mind and behavior have changed over the course of evolution and how they have been influenced by chemical factors. Through these fields, chemistry and psychology create mutually rich and perfect concepts that help us better understand the human mind and psyche.

Teaching chemistry in combination with social sciences makes the educational process more meaningful and effective. This integration helps students better understand science, apply it in real life, and develop research skills.

Psychological and pedagogical foundations of integration.

Perhaps human nature is essentially integral, and this integration in man is primitive: at the level of the material shell (interacting chemical, physiological, spiritual processes); and at the level of understanding personality; and at the level of thinking – logical, figurative, associative. Therefore, integration is a natural way of knowing oneself and the world around us, expressed in a combination of aesthetic, cognitive, historical, genetic, socio-functional aspects.

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