DEVELOPMENT AND APPLICATION OF DIDACTIC MATERIALS BASED ON REAL-LIFE EXPERIENCES IN CHEMISTRY EDUCATION

Fayzullaeva Charoskhon Obidovna
Teacher of Chemistry, Faculty of Natural Sciences,
National Pedagogical University of Uzbekistan named after Nizami
(97-538-80-98) (charosxon.fayzullayeva@mail.ru)

Abstract

In this article, the development and application of didactic materials based on life experiences in chemistry education is important for activating the educational process, developing students' ability to apply their knowledge in practice, and increasing interest in chemistry among them. This approach not only improves the quality of education, but also helps students think creatively, develop environmental awareness, and form practical skills.

Keywords: Contextual education, knowledge, knowledge, skills, interactive, didactic, technocratic, case study.

The development of didactic materials corresponding to the contextual educational environment is an approach aimed at connecting students' knowledge with life experiences, ensuring interdisciplinary integration, and making the educational process interesting and meaningful. *Here are recommendations for the effective organization of this process:*

1. Defining the learning objective. Clearly define learning objectives (e.g., "Application of Chemical Reactions in Life" or "Distinguishing Organic Compounds in Everyday Life"). Creation of contextual tasks for the development of students' knowledge, skills, and abilities.

2. Selection and adaptation of materials. Choosing topics that match students' life experiences (e.g., making esters, paper production, or food chemistry). Development of laboratory work, projects, and case studies aimed at forming practical skills. Selection of materials that correspond to the conditions, culture, and interests of the students' place of residence.

3. Application of interactive methods. Implementation of game-based learning, intellectual chemistry games, or logical tasks. Organizing group discussions on life problems. Role-playing games, teaching by dividing into roles for solving life problems.

4. Creating projects related to real life. Experiments, performing practical work with students, for example, testing the technology of making vinegar or paper. Scientific research, involving students in small scientific research, educational

research.

5. Development of evaluation criteria. Implementation of criteria aimed at solving life problems in assessment (for example, identifying skills used through the analysis of complex ethers, evaluating products created in small groups or in the process of individual work).

6. Development of didactic tools. Preparation of visual materials, posters, electronic manuals of interest to students. Application of virtual laboratory sessions or simulations.

The integration of technocratic components of the didactic system into activity is important for the effective organization of the educational process. *This integration will be carried out in the following main areas:*

1. The introduction of technologies into the educational process provides opportunities for visual and interactive study of topics through the use of interactive methods, Smart boards, virtual laboratories, simulations and AR/VR technologies, automated assessment, assessment of tests through automated systems, quick and accurate determination of students' knowledge level, integration of electronic platforms, distance learning systems, and the dissemination of educational materials to the general public.

2. The implementation of information and communication technologies includes the use of electronic textbooks and resources, the creation of a database of online tests and tasks to consolidate students' knowledge, constant monitoring of scientific and technical innovations and adaptation to the educational process.

3. Modernization of didactic components is carried out in connection with the use of programs that develop thinking, special programs that encourage students to think critically and creatively, the creation of a digital infrastructure for educational activities, the introduction of electronic diaries, mobile applications and other convenient tools, activities to combine traditional education with technological approaches using hybrid methods.

4. Adaptation of innovative technologies for pedagogical activity is carried out through the implementation of STEAM programs (Science, Technology, Engineering, Arts, Mathematics), improvement of experiments and practical classes using technology, and the use of technological tools that guide students towards research activities.

5. Strengthening the individual approach in the educational process is carried out by identifying the individual abilities of students and creating programs corresponding to them, developing an individual curriculum for each student through flexible (adaptive) learning platforms.

Modernization of the didactic system through the integration of technocratic components into activity, along with improving the quality of education, will

significantly improve the level of student learning. At the same time, this process harmonizes the education system with the requirements of globalization and modern technological development.

The use of cases occupies a special place in the harmonization of life processes with education. A case study is a set of educational and technical materials or problem situations designed to assess students' knowledge in the learning process, develop independent thinking skills, and ensure understanding of a specific topic. Through cases, students learn to apply their theoretical knowledge in practice and develop the immunity to express their opinions when analyzing real-life issues.

The main features of cases require the student to solve a problematic situation through problem-centration, due to their proximity to real life, the described situations are taken from real-life examples, increase students' interest, encourage multifaceted analysis, encourage students to look at the same issue from different points of view, increase activity, and in the process of work, students develop skills in independent learning, group work, and discussion.

Cases are divided into analytical cases requiring the development of methods for analyzing and solving a problem, decision-making cases requiring optimal decision-making in a given situation, alternative cases requiring comparison of different solutions and selection of the most optimal one, and role-playing cases that perform various roles in a problem situation and encourage its solution.

Working with cases includes the following steps:

understanding the problem - clarifying the issue raised in the case;

data analysis - studying the causes of the problem based on the given facts;

development of alternative solutions - development and evaluation of several solution options;

Selection of the optimal solution - determination of the most optimal and practical option;

drawing conclusions - presenting a solution to the problem being solved.

The advantages of cases are that they develop students' ability to think critically, improve their ability to analyze real-life situations, form a culture of collaborative work, and allow them to apply knowledge in practice.

Case study: Chemical defense mechanisms of wild plants.

Event description: Some wild plants release chemicals such as acetic or butyric acid to limit biological competition in their environment. These substances inhibit the growth of other plants and harm them. You need to analyze this situation and answer the following questions.

Task: Explain the chemical process. Explain the chemical properties of acetic and butyric acids. Explain how they can influence the vital activity of plants. Explain the benefits of these acids for wild plants.

What kind of ecological balance does this process contribute to? Suggest a practical application. How can this process be used in human life? What products or technologies can be developed using acids secreted by wild plants?

Additional questions for problem analysis:

What is the effect of acetic and butyric acids on other organisms? How is this process related to the habitat of wild plants? How should the ecological and economic aspects of extracting chemicals from wild plants be considered?

Final result: Based on this case study, students should draw conclusions about the chemical defense mechanisms of wild plants and determine their potential applications in human life.

Case Study Task: "Blood-eating insects and lactic acid"

Story: A group of students is asked to conduct research on insect hunting habits. During the study, they need to figure out how blood-eating insects like mosquitoes separate the blood of warm-blooded animals from that of cold-blooded ones. The students learned that mosquitoes mainly find their way to warm-blooded animals' blood by sensing the smell and taste of a substance. This substance is also found in cabbage and cucumber pickles.

Questions: What is this substance called and how is it formed in the blood of warm-blooded animals? Where do mosquitoes and other blood-eating insects detect this substance? What other chemical products can be formed in this process of metabolism?

Task: Identify the process, explain the mechanism of formation of this substance, i.e., the anaerobic breakdown of glucose, using chemical equations. Give a real-life example: explain the chemical and biological significance of a substance and organize a discussion about its role in human life. Develop an experimental plan: Develop an experimental plan to test this substance and investigate its role in attracting blood-eating insects. Develop plans to mislead or trap mosquitoes using these substances.

Answers: This substance is lactic acid (lactate), which is formed during the anaerobic breakdown of glucose.

Chemical reaction equation:

$$C_6H_{12}O_6 \xrightarrow{anaerobic} 2CH_3CHOHCOOH + ATF_{(energy)}$$

The smell of lactic acid comes from the skin of the body and is felt by insects. This is done using their special olfactory receptors. As a result of anaerobic breakdown, along with energy production, lactic acid and ATP molecules are produced.

Experiment: Determining the role of lactic acid in attracting mosquitoes.

Place the pickled cucumber and cabbage in two different containers.

Place only water and cucumbers in one container, and brine with lactic acid in the other. Observe which container attracted more mosquitoes and analyze the results.

Case study assignment: "History and acquisition of paper."

Story: Learning from Nature. The substances produced by bees have sometimes been sources of inspiration for humans. It is not surprising that this phenomenon also arose as a result of the study of activity of this nature. In ancient China, this substance was used to make coins called "flying coins." The spread of the secrets of technology is connected with the fact that in 610 Buddha monoxi Dan-ho went to Japan and taught the secret of producing this substance. The Japanese called it "vasi" and began producing it using their own methods. In 751, the Arabs defeated the Chinese at the Battle of Talas and brought the technology to Samarkand and Baghdad.

Task: identify this product using the above information.

Analyze the production process of the product from a chemical point of view. What chemical substances and processes are involved in obtaining this product from plants?

Briefly assess the importance of the product in our lives.

Problematic questions:

What natural materials are important for paper production?

How can the environmental problems of paper production be solved?

How have modern technologies changed paper production?

Result: Students study the history and chemical basis of paper, develop the ability to connect life experiences with science.

Case study assignment: "Decay of protein substances, cadaveric poison"

Story: Throughout history, there have been many cases of damage when graves were opened for various reasons. The causes of this process can be explained by the accumulation of toxic substances formed as a result of the decomposition of chemical proteins. Explain what chemical processes occur regarding the formation of cadaverine and its dangers. What precautions should be taken against cadaverine during exhumation (opening of graves)?

Skills: Understanding the processes of protein decomposition and neutralization. Understanding the chemical properties of cadaverine (pentamethylenediamine) and its side effects. Identification of risks and development of precautions during the exhumation process.

The answer should indicate: Chemical processes, what chemical reactions occur as a result of the decomposition of protein substances, as well as with which substances cadaverine can react. To which group of organic substances does this substance belong?

Negative effects of cadaverine and its harmful effects on the body.

Discuss the dangers of cadaverine during the exhumation process and what precautions should be taken.

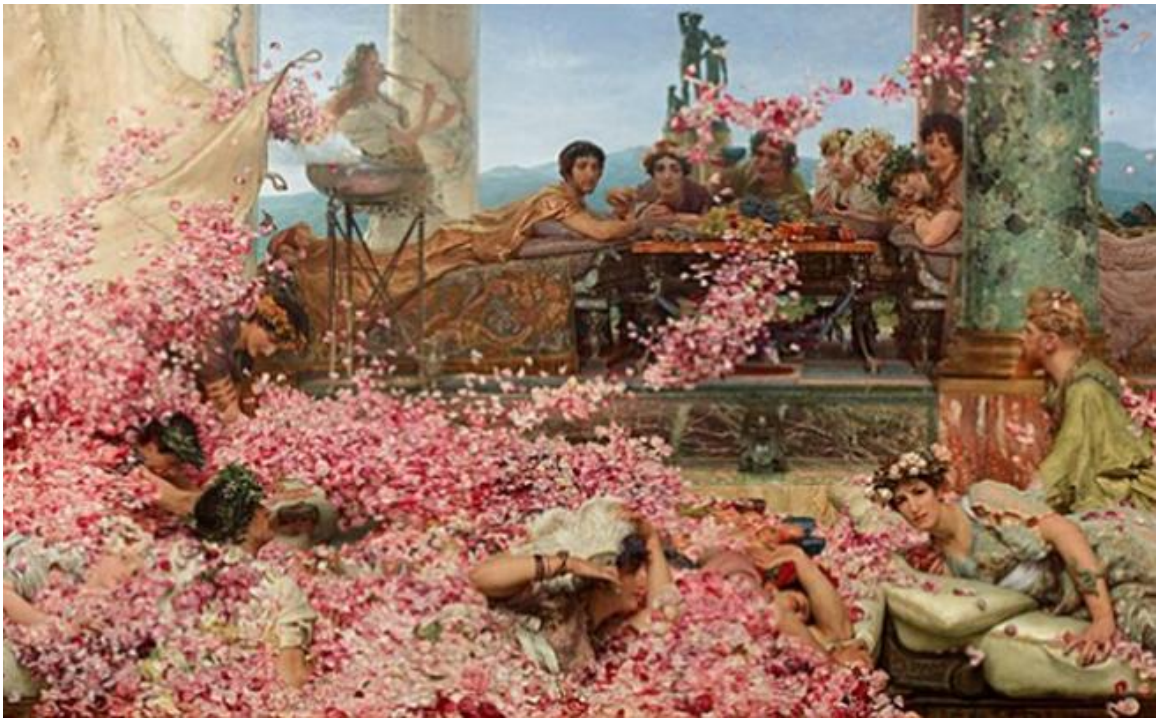
Recommendations: Use of chemical protective equipment to ensure safety during the exhumation process.

Taking necessary measures for safe operation in laboratory and field conditions.

This type of case study encourages students to analyze chemical processes and identify risks, and also teaches them to take precautions in practical situations.

Case study: "There are no harmful substances in nature, only harmful quantities (D.I. Mendeleev) "

The historical painting depicts a feast organized by order of the Roman emperor Heliogabalus. The emperor organized this feast after hearing news that many of his relatives were organizing a rebellion against him.



Lourens Alma-Tadema

Task: Explain the plan of the Roman emperor. Name the weapon used by the emperor and explain its chemical composition.

Explanation: The enemy who planned the assassination gathered their relatives and killed them by pouring rose petals (complex ether) over them for a long time. These petals contain a complex ester, a large amount of which can poison the body.

When preparing your answer, consider the following questions:

What are the chemical properties of the esters in rose petals?

Why can large quantities of esters be harmful to the body?

For what purposes did the Roman emperor use this weapon?

In the 11th grade, "Types of Chemical Bonds. Based on the knowledge gained in the 9th grade "Carbon" and the 8th grade chemistry course (chemical bonding, crystal lattice), students can easily and more broadly explain the physical properties of diamond and graphite based on the structure of their crystal lattices. It is advisable to

organize the lesson based on a computer presentation, comparing the structure of matter, the structure of natural materials, the structures of objects created by man, analyzing the similarities between them and their influence on quality indicators.

References

1. Конасова Н.Ю.Новые формы оценивания образовательных результатов учащихся: Учебно-методическое пособие для администраторов и педагогов общеобразовательной школы.-СПб.: КАРО, 2006.-112с.
2. Кохановский В.П.,.Лешкевич Т.Г., Матяш Т.П., Фатхи Т.Б. Основы философии науки. Изд. Феникс. Ростов-на-Дону. 2004.
3. Кудинова Н.Ф. Формирование интереса учащихся к химии на основе реализации в преподавании принципа связи обучения с жизнью: Автореф. дис... кандидат педогогических наук. -Москва: 2009. -24 с.
4. Кузнецова Н.Е., Шаталов М.А. Обучение химии на основе межпредметной интеграции: 8-9классы: Учебно-методическое пособие. М.: Вентана Граф, 2004.-352с.
5. Кукушкин Ю.Н. Химия вокруг нас. Справ.пособие.-М.: Высшая школа, 1992.-192с.
6. Кэрролл Л. Логическая игра. Перевод с английского. М.: Наука гл.ред.физико-математической литературы. 1991 -189с.
7. Левицкий М.М. О химии серьезно и с улыбкой. М.: ИКЦ Академкнига, 2005.-287с.
8. Леенсон И.А. Удивительная химия.-М.: Изд-во НЦ ЭНАС, 2006.-176с.
9. Лезер Ф. Тренировка памяти. Изд-во „Мир", Москва, 1979. 168с.