

DEVELOPMENT OF TASKS IN CHEMISTRY FOR THE FORMATION OF NATURAL SCIENCE LITERACY

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Аңдатпа: мақалада 7 сынып оқушылардың химия сабағында оқу мақсаттарына сәйкес жаратылыстану-ғылыми сауаттылығын қалыптастыру үшін тапсырмалардың мысалдары қарастырылған. Білім мазмұнын оқушының функционалдық сауаттылығын дамыту, білімдерін практикалық жағдаяттар мен әлеуметтік бейімделу барысында берілген жағдайды күнделікті өмірімен байланыстыра білу, түсіндіру, талдау, сараптау, мәтін, график немесе кесте түрінде мәліметті белгілі бір ретке келтіру арқылы оқушының дағдыларын қалыптастыру жолы болып келетініне мән берілген.

Кілт сөздер: химиялық әдістер, кіріктірілу, әдістеме, бағалау, тапсырма, химияны оқыту

Introduction

In recent years, the secondary education system has been undergoing serious changes, a new competence approach is associated with the need for continuous improvement of practical skills, mastering new information technologies, the ability to cooperate and work in a team. These changes require a revision of not only the content of training, but also approaches to the educational process and teaching methods.

Modern requirements are reflected in the updated program of secondary education, active approach in learning, which is focused not only on specific knowledge, but also on the activity nature of education [1]. Basic general education is the final stage of compulsory education, therefore, the basic requirement for its content is to achieve graduate's high level of functional literacy.

Along with the traditional concepts of the formation of a highly educated person, it is necessary to actively introduce a competence-based approach in education, that is, to form the ability to act effectively in non-standard situations. In other words, a person should be able to show his knowledge in a specific life situation.

Changes in goals and methods in education are reflected in the program of the PISA international study (Program for International Student Assessment), the main purpose of which is to assess the level of readiness of 15-year-old students for active entry into society, i.e. their functional literacy. In the PISA 2000-2003 study . [2] natural science literacy is understood as "the ability to use natural science knowledge to identify problems in real situations that can be investigated and solved using scientific methods to draw conclusions based on observations and experiments. These conclusions are necessary for understanding the world around us and the changes that human activity brings to it, and for making appropriate decisions."

Research methods and techniques

The results of the research allow us to identify the degree of development of students' skills to use knowledge in situations close to real. In the future, such skills should contribute to the active participation of school graduates in the life of society, as well as to acquire new knowledge.

While doing PISA research tasks, students must demonstrate: the ability to describe, explain and predict natural science phenomena and the ability to interpret scientific arguments and conclusions that they may encounter in the media; the ability as well as understand research methods, identify issues and problems that can be solved using scientific methods.

The main characteristic of tasks for assessing scientific literacy are situations in which various problems are described. The situational tasks offered for students are related to the daily life of people, maintaining health, using knowledge of natural sciences for the development of technology and environmental problems.

The analysis of the research results showed significant shortcomings in the ability of students to apply the knowledge and skills acquired at school in the context of life situations [2]. A detailed analysis of the data obtained allows us to conclude that in the practice of teaching, students do not meet with tasks:

- *containing voluminous textual information, material including tables, diagrams, graphs, figures and diagrams;

- includes material from various subject areas, where you need to integrate theoretical knowledge and to apply the skills to select and use the appropriate situation described ways of thinking such as analysis, reasoning, communication, etc.;

- in which it is difficult to determine to what area of expertise they belong, to find a way of action or information necessary for the formulation and solution of problems;

- * requiring additional information (including beyond the scope of the situation described in the text of the assignment) or, on the contrary, containing redundant information and "superfluous data";

- * complex or structured, including several interrelated questions: each question tests the mastery of a separate knowledge or skill, and a group of questions - some of their totality.

It is believed that this approach reflects the complexity of the real world to a greater extent and reduces the time for introducing students to the problem under consideration.

As a result of the analysis of the tasks of the international study, the following features of the proposed tasks can be distinguished

- * the conditions of the tasks are presented in an implicit form, contain information that is descriptive in nature and is basically not required to answer the question;

- there are a lot of additional details in the condition, however, some of the necessary information is missing, some of this information may be contained in the question;

- * some of the information is presented in various formats, along with the text there are graphs, tables, diagrams, reference books;

- * the logic of the necessary information differs from the logic of a specific subject (educational or scientific), it is correlated to the logic of a specific life situation (the condition is taken on the basis of a life situation, not from a textbook);

- the response form is not specified or is set implicitly.

The signs of tasks demonstrate certain differences between such tasks from the tasks that are familiar to students, offered in the lessons of individual disciplines. The main difference is that their solutions are difficult to fit into the framework of familiar algorithms.

To solve the problems proposed in the PISA study, it is necessary to apply and possess the following general academic skills:

- * differentiate, isolate the desired information;

- * to make a versatile search for information: in the text of the question, in knowledge of various disciplines, in your own life experience;

- * highlight the question and additional information in the assignment, structure the question, change its form;

- * choose the information needed to make a decision;

- * analyze the selected information to get an answer;

- * interpret the task into a relatively standard view;

- * develop an action plan to find a solution;

- * identify the criteria for the correctness of the program;
- * when performing actions, understand what is being obtained, discard unnecessary results, and check them;
- * restore the question-result relationship and convert the result into an answer;
- * develop the design of the response and its design;

The listed general academic skills and abilities are developed when solving creative and integrated tasks. Creative and integrated tasks are rarely used in school practice, they require a sufficiently high qualification of the teacher and additional study time. However, it is quite possible to gradually introduce elements of such tasks into everyday practice.

Research results and analysis

The development of such educational, creative and integrated tasks, their typology, working out the methodology of their use in chemistry lessons at the primary school is relevant and important for the formation of natural science literacy, and hence for the harmonious participation of school graduates in the life of society.

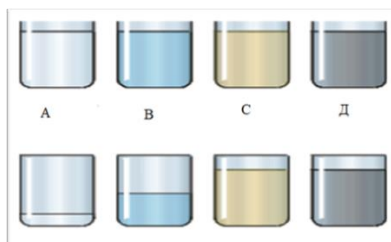
Below are examples of creative tasks.

On the topic of a change in the state of matter and an explanation from the point of view of particle theory, we can offer a task for evaporation

Task 1. Vegetable sunflower oil is a storage liquid with a density of $920-927 \text{ kg / m}^3$ at a temperature of 10^0 C . Freezing temperature is in the range of $-16^0 -19^0 \text{ C}$.

Ethanol is a volatile, flammable, colorless, clear liquid with a density of 0.79 g/cm^3 and a boiling point of 78.3^0 C . Mercury is the only liquid metal at room temperature, boiling point 357^0 C , density 13596 kg/m^3 .

Water is a colorless, clear liquid with a boiling point of 100^0 C . At room temperature, four glasses are filled with the same amount of water, alcohol, mercury and vegetable oil. Over time, the following changes were observed, as shown in the figure.

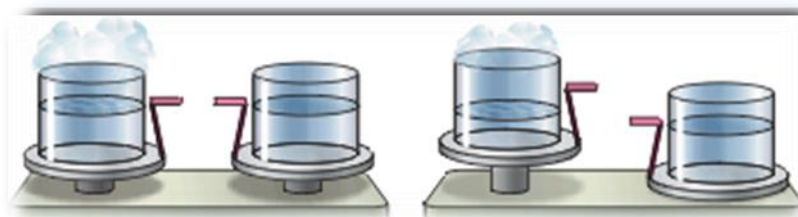


- 1) Identify the item in each glass and write the answer on the chart.

A glass	B glass	C glass	D glass

- 2) Explain your answer.

Task 2. The same amount of liquid is placed on both sides of the balanced scales. In time, one vessel became heavier than the other.



- 1) Write the reason for the change.

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- 2) Suggest two ways to keep the balance of liquids.

For continuous self-education, it is extremely necessary to be able to work with various sources of information (textual and non-textual). By performing the proposed task, students do not just get actual knowledge, but by presenting them in various ways, they learn to perceive non-textual information, adequately evaluate it, and choose methods for presenting their own knowledge in subsequent educational activities.

Explanation of the phenomenon. Formulation of the conclusion taking into account the proposed situation

Task 2. Copper wire, cleaned from the varnish coating, was introduced into the flame of an alcohol lamp. After a while, its surface turned black. Explain the observed phenomenon.

At first glance, the answer is obvious, the black plaque is copper (II) oxide. But from their daily experience, children know that the kettle on the fire is covered with soot, which means that the black plaque on the copper wire can also be soot. Thus, taking into account the life experience of students, the answer is ambiguous.

Reasoned, clear and clear formulation of conclusions.

Demonstration of communication skills

Task 3.

Different methods are used to separate a mixture consisting of simple and/or complex substances.

a) Offer options for the composition of the mixture, which can be divided according to the proposed separation scheme:

b) This scheme can be used to describe the process of natural water purification. Make a story describing the process of drinking water purification according to the scheme, given that it is intended for elementary school students. Please note that some terms need to be explained.

Conclusion

As the experience of pedagogical activity shows, a student may know the essence of the issue, but he is not able to share his knowledge with others, i.e. his communicative competence is not formed. On the one hand, it is well known that a deep understanding of the subject is formed when you can tell about very difficult things in an accessible language to the interlocutor. On the other hand, the conditions of the task are set vaguely: when solving, the student has to rely on his life experience, attract knowledge gained in other subjects of the natural science cycle, make assumptions and accept or reject them.

The experience of using such tasks in chemistry lessons in the 7th grade shows that the implementation contributes to the formation of students' natural science literacy.

Literature

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