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Application of Pedagogical Technologies to the Topics of the Metals Department

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Abstract: This article is devoted to the role of organizing, using, and mastering the subject of debate (scientific discussion and free-thinking) in teaching the topics of the Department of Metals in Chemistry. The effectiveness of the training conducted in this way was studied.

Keywords: problem method, metal, aluminum, zinc, educational technology

The application of modern pedagogical technologies in the educational process requires, first of all, the humanization and democratization of pedagogical relations. Because any pedagogical technology used without the humanization and democratization of pedagogical relations does not give the expected effect.

Literature review and methodology

N.G.Rahmatullaev, H.T. In the literature of Omonov, Sh.M.Mirkomilov "Methods of teaching chemistry" general pedagogical and didactic requirements for all stages of education to improve the effectiveness of independent work of students based on program knowledge, imagination, and skills, increase interest in scientific thinking, science, deepen professional knowledge, theoretical and practical There is information on how to increase their activity during the training, how to improve the structure and content of the stage "Methods of teaching chemistry." These

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publications also provide information on the use of innovative and information technologies to help students better understand the topic of metals.

Omonov H.T., Khojaev N.X., Madyarova S.A., Eshchonov E.U., Chernobelskaya G.M. and Selevko GK in their research work on the psychological and pedagogical foundations, the concept of the structure of the functions of the pedagogical system, modern educational technologies.

Raymond Chang's textbook covers theoretical and experimental data on metals and their properties on a scientific basis.

DISCUSSION AND RESULTS

An important condition for increasing the effectiveness of the educational process in higher education is a systematic approach to this process, and teachers are recommended the following types of lessons:

1. Lecture (introductory lecture, thematic lecture, summary lecture).

2. Seminar (knowledge-strengthening, designed for independent acquisition of new knowledge) lessons.

3.Modular lesson.

4. Problem (mental attack) lessons.

5. Debating (scientific discussion and free-thinking) lessons.

6. Didactic-play (story-role, creative, business, conferences, games).

7. Tests (didactic cards, test assignments, using a cross-checklist, information technology control programs).

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The specificity of these lessons is based on the problematic situations created during the lesson.

Modern educational technology in higher education institutions is the study of problem-based learning and problem-solving. Educational technology, on the other hand, is about stimulating the evolving learning process, the process of actively learning the problem-based learning task, nurturing a way of doing research and thinking.

The role of student independence in problem-based learning is more effective than in reproductive learning methods. The purpose of problem-based learning is to find answers to educational problems, problems, and questions in the process of working with students, to acquire new knowledge by solving them, to create and solve problem situations in students' educational activities.

Keys assignment. Regarding non-ferrous metals, our great ancestor Abu Rayhan Beruni writes in his works: “There is no other country in the world that produces gold of such quantity and purity; but the deserts and sands make the road difficult. Where there is gold, there is silver.

Case Study: Based on the pictures provided, provide information on the use of metals in chemical production, the human body, and household items.

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In higher education chemistry, the topic of “Metals” is one of the topics that is almost always practiced in every class. The nature of the experiments performed (demonstration experiment, practical work, and laboratory experiments) is determined by the level of complexity of the experiment and the nature of the cognitive task performed in the lesson [2].

Problematic questions that arise in the process of demonstrating a chemical experiment

- to form hypotheses;

- to solve theoretical problems;

- encourages to draw the right conclusions.

Thus, the use of problem-based experiments in the teaching of "Metals" in the chemistry course is always relevant. Therefore, a pedagogical experiment was conducted to develop a methodology for conducting problem experiments and to test the effectiveness of this methodology. The experiment was conducted with students of "Chemistry and its teaching methods" in inorganic chemistry.

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Stages of the experiment:

- Conducting problem experiments in the study of "Metals".

- Testing.

- Conducting a questionnaire.

The choice of topics in the “Metals” section is explained by the fact that students often make mistakes when writing equations for the interactions of metals with water and acids.

The results of the experiment were discussed in the form of a heuristic conversation. We consider the methodology of organizing experiments using a problem-based approach using two specific examples.

Experiment 1. Interaction of active metals with water.

Laboratory equipment and reagents: aluminum Al (granules), sodium Na, phenolphthalein, crystallizer.

Progress:

For the experiment, we take samples from two active metals (see the stress series of the metals): Al (granules) and Na. Add 2-5 drops of phenolphthalein to a water-filled crystallizer and place the aluminum granules in a pre-cleaned of kerosene (with dry filter paper) and a small amount of dried Na, and a water-filled solution.

Observations:

Sodium - Na

Aluminum - Al

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sodium “runs” on the surface of the water and reacts quickly with it, disappearing completely and the water turns a pinkish-dark red color.

$2Na + 2H_2O \rightarrow 2NaOH + H_2 \uparrow$

no signs of a chemical reaction are observed in the aluminum solution

All active metals react with water. Aluminum is a highly active metal that must react with water according to the following equation:

$2Al + 6H_2O \rightarrow 2Al(OH)_3 + 3H_2\uparrow$

Problem: Aluminum Al - active metal - Are there any signs of a chemical reaction with water?

Discussion of the problem: Aluminum is usually protected by an Al_2O_3 oxide film. It is this oxide film that protects the aluminum from active exposure to water, and if it is removed, aluminum will react actively with water.

Experiment № 2. Interaction of metals with acids

Reagents and equipment: aluminum Al (granules), zinc Zn (granules), HCl 40% hydrochloric acid, phenolphthalein; test tubes.

Progress:

Add 3 ml of 40% HCl solution, 2-3 drops of phenolphthalein to two numbered solutions, and place Al granules in one Zn and the other. Pour a small amount (about 2 cm in height) of 40% HCl solution into the small crystallizer.

Observations:

Rux - Zn

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Aluminum - Al

the reaction proceeds violently, with the release of gas, does not change the color of phenolphthalein

$2HCl + Zn \rightarrow ZnCl_2 + H_2 \uparrow$

initially no reaction symptoms are observed, then the reaction proceeds with intense gas release, the color of phenolphthalein does not change

$6HCl + 2Al \rightarrow 2AlCl_3 + 3H_2 \uparrow$

Problem: All metals obtained are active, but do they react differently with acid? In particular, aluminum and zinc. Both metals are close to each other in the activity series of the metals, their standard electrode potential values are close to each other

$E^\circ (Al^{3+} / Al) = -1.66$ eV, $E^\circ (Zn^{2+} / Zn) = -0.76$ eV.

Discussion of the problem: Using the results of Experiment 1, the students concluded that the sudden appearance of gas bubbles on the surface of aluminum is due to the presence of a more durable oxide film on its surface.

Therefore, the strong oxide film on the surface of aluminum allows it to protect aluminum not only when it interacts with water, but also when it interacts with strong acids. The strength of the oxide curtain was tested by heating an aluminum wire in a gas furnace flame. Aluminum dissolves inside an Al_2O_3 capsule, so its oxide film walls prevent aluminum from leaking when the aluminum is heated.

Conclusions from the experiments: According to the series of stresses of metals, metals up to hydrogen squeeze it out of the acid solution (exception: alkali and alkaline earth metals: they react with water to dissolve acids).

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After reviewing the topic, a test was conducted on the topics of the “Metals” section to test the students ’knowledge. To test the effectiveness of the selected method, we used the topic mastery level (MO’D) criterion.

The result of the pedagogical experiment was calculated according to the following formula:

MOD = n5 · 1 + n4 · 0.64 + n3 · 0.36 + n2 · 0.36 / N x 100%, where

where n5 is the number of students rated "5" (in percent),

n4 - the number of students rated "4" (percent), "n3" - the number of students rated "3" (percent), "n2" - the number of students rated "2" (percent), N - the total number of students in the group (percent).

The result is up to 60% - the level of mastery of the topic (low).

The result is from 60 to 70% - the level of mastery of the topic (average).

The result is 70% and above - the level of mastery of the topic (high)

The learning outcomes in the study group showed the following:

MOD = 1 · 1 + 6 · 0.64 + 2 · 0.36 + 0 · 9 x 100% = 61.8%

The level of mastery of the topic showed an average result.

A survey was also conducted to determine the effectiveness of this problem-based teaching method.

42 students from 1st and 2nd stage students took part in the survey.

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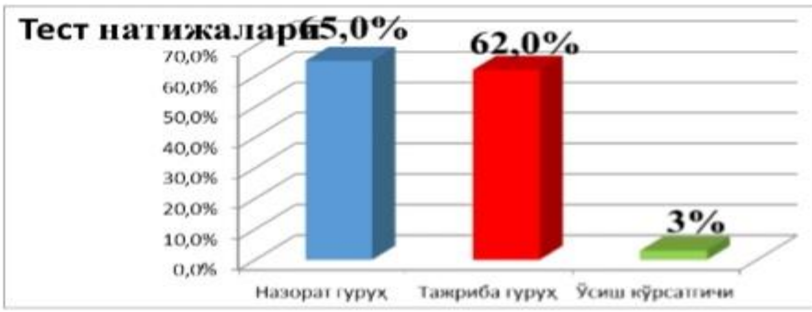
To experiment, students were divided into experimental and control groups. Mathematical and statistical analysis was carried out based on data obtained at the beginning and end of the experiment.



1- расм. Тажриба-синовдан олдин назорат ва тажриба гуруҳларида ўзлаштириш кўрсаткичлари

The diagram shows that the average mastery of students in the experimental groups was 15% higher than in the control groups. An analysis of this research showed that all students surveyed were interested in modeling the situation when repeating chemical experiments. All questionnaires noted that they had no difficulty in perceiving new material taught in a problem-based education system, and wanted these lessons to be used more in explaining new material.

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Based on the comparison of the initial and final results of the test, it was found that the students developed the ability to explain the interaction of some metals with acids and alkalis, the general chemical properties of metals, which helped to master this topic effectively.

Conclusion

In summary, our research argumentative teaching allows students to actively apply previously acquired knowledge and skills, increase the level of knowledge, understanding of chemical phenomena, as well as gain experience in solving specific, creative scientific discussion and free-thinking tasks.

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