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# TEACHING CHEMISTRY BASED ON CHEMICAL EXPERIMENTS

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**Annotation**
In this article is devoted to one of the actual problems of chemistry subject - the use of chemical experiments in chemistry teaching. The «chemical experiment» is considered as a teaching method. The use of chemical experiment in teaching process helps to students in understanding the diversity of studied chemical acts, their nature, the real essence and dependence on test conditions.

**Keywords:** problem-based learning, chemical experiment, problematic issues, chemistry teaching, teaching methods.

Today, education, like other social institutions, is influenced by scientific and technological progress (universal digitalization) and globalization. It is clear that us, one of the main problems is the problem of the quality of educational services provided, which is confirmed by the activities of UNESCO: annual monitoring of educational areas is carried out, a rating of countries is compiled according to the Education Level Index.

The Law of the Republic of Uzbekistan "On Education" and state educational standards, in turn, became a purposeful step in solving this problem.

Increasing requirements for the quality of education determines the leading role of teaching methods as a science and academic discipline that studies the theory, practice and methodology of teaching to achieve learning objectives. The study of the experience of scientists-teachers and methodologists of the past becomes relevant, knowledge of which is necessary for the all-round preparation of future teachers and teachers for the conditions of the modern educational environment. On

the example of chemistry, we want to consider in this paper the evolution of the teaching methodology as a direction of domestic and foreign scientific and pedagogical thought, to determine its basic content in the conditions of the SES(State educational standard), to highlight the priority areas for the development of school and professional chemical education.

The methodology of teaching chemistry is a science and academic discipline (primarily in pedagogical universities), which develops a general and special methodology for chemical education in programs of secondary and higher education. To improve the quality of students' knowledge of chemistry and the formation of cognitive independence of problem-based learning, chemistry is the most experimental science, then its teaching is based on a chemical experiment as a source of knowledge, putting forward and testing hypotheses, as a means of consolidating knowledge and controlling it.

The use of a chemical experiment in the learning process and an improved methodology for conducting them helps students in understanding and understanding the versatility of the studied chemical processes, their nature, real essence and dependence on the conditions. It also provides an opportunity to gain experience in concrete problem solving and creative tasks.

We can conclude that problematic questions when setting up a chemical experiment make students:

- build hypotheses;
- resolve theoretical issues;
- draw correct conclusions;
- predict the properties of substances

Improvement of the university of Higher education chemical experiment occurs mainly in the following areas:

- the first is the modernization of instruments, apparatus and other equipment for conducting experiments;
- the second is the improvement of the technique of conducting the experiment, for example, work with small amounts of substances;
- the third is the introduction of separate additional new experiments;
- fourth - the development of an integral system of fundamentally new problem-developing chemical experiments for universities. New experiments will help enrich the content of the university course to a considerable extent, and will enable the

teacher to systematically apply problematic and research forms of organizing the educational activity of students.

We will consider from our experience the practical application of "chemical experiment" in the process of teaching chemistry at the Department of Chemistry Teaching Methodology of Tashkent State Pedagogical University. Topic: Dependence of chemical reactions on the nature, concentration and temperature of reactants. "The rate of chemical reactions. Chemical balance for students".

Previously, we introduced students to the concept of the rate of a chemical reaction and prepared them in detail for the perception of the material on the topic "Factors affecting the rate of a chemical reaction", repeating the material of the curriculum on the topics: "Metal activity series", "Concentration of solutions", "Homogeneous and heterogeneous reactions". At the lesson on the topic "Dependence of the rate of chemical reactions on the nature of the reactants, concentration and temperature", we checked the material covered in the previous lesson and the material on repetition topics .

Purpose of the work: to conduct an experiment showing the dependence of the rate of chemical reactions on the nature of the reactants, concentration and temperature.

The form of the experiment: frontal (demonstration experiment), or experiment in laboratory work. Equipment and reagents: 10% HCl solution, 10% $H_2SO_4$ solution, Mg (sawdust), Zn (sawdust, granules and powder), Fe (sawdust), CuO (powder), test tubes, test tube holder.

Progress:

Experience number 1. Dependence of the rate of a chemical reaction on the nature of the reactants. Pour 3 ml of HCl solution into three test tubes (signed, numbered) and add weighed pieces of sawdust of the same mass into each of the test tubes: in the first - Mg, in the second - Zn, in the third - Fe;

Observations: that a chemical reaction takes place in all three test tubes with gas evolution.

Reaction equations:

$Mg + 2HCl \rightarrow MgCl_2 + H_2\uparrow$ (very turbulently)

$Zn + 2HCl \rightarrow ZnCl_2 + H_2\uparrow$ (turbulently)

$Fe + 2HCl \rightarrow FeCl_2 + H_2\uparrow$ (slowly)

Problem:

The masses of the taken substances, weighed portions of solid substances, the concentration of hydrochloric acid, the reaction conditions are the same, but the intensity of the ongoing processes (the rate of hydrogen evolution) is different?

One of the answers: We took different metals.

Teacher's question: How do chemical elements differ according to your knowledge Periodic law and the Periodic system of D. I. Mendeleev?

Answer: Ordinal number, position in the Periodic system of D. I. Mendeleev, that is, they have a different electronic structure, and therefore, simple substances formed by these atoms have different properties.

Teacher: that is, these substances have a different nature. Thus, the rate of a chemical reaction will depend on the nature of a particular reactant, since they have different structures and properties. From the discussion of the problem, we can conclude:

The rate of a chemical reaction will depend on the nature of the reactants: the more active the metal (substance), the higher the rate of the chemical reaction.

We have demonstrated the position of chemical elements in the "Series of activity of metals".

Most of the experiments conducted at the university are illustrative and are used only to confirm the phenomena being studied. At the same time, it is advisable for students to offer not only illustrative experiments, but also experiments of a problematic nature, since they provide activation of the cognitive activity of students, teach them to think independently, develop interest in the subject, improve knowledge and expand their scientific horizons.

If we said conclusion, a chemical experiment and an improved methodology for conducting it at a university can also be a means of development and contribute to the implementation of the most important provisions of the theory of developmental education.

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