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## FORMATION OF METASUBJECT SKILLS IN CHEMISTRY LESSONS

**Abstract.** This article examines the features of the formation of meta-subject skills in students in the process of studying chemistry, in the context of the transition to new standards in education. The conducted research proves the effectiveness of the developed methodology and its positive role when included in the educational process.

**Keywords:** *state educational standard, meta-subject skills, meta-subject results, universal learning activities*

In the context of modernization of the education system, the school has become acutely faced with and currently remains the problem of students' independent successful acquisition of new knowledge, skills and competencies, including the ability to learn.

Qualitative changes in the learning process are aimed at developing in students a systematic understanding of the world around them, a clear understanding of the existing relationships in natural and man-made systems. One of the sections of the second generation standards is devoted to planned results, which determine not only subject, but also meta-subject and personal results. In this regard, the purpose of studying chemistry is to create conditions for students to have a holistic understanding of the world and the role of chemistry in creating a modern natural science picture of the world.

Chemistry is the science of nature. In nature, chemical, physical and biological phenomena are interconnected. In the basic curriculum, these phenomena are studied separately, thereby breaking the connections between them. To solve this problem, the school should provide for the implementation of the principle of meta-subjectivity (Gromyko Yu.V., 2000), which implies and opens up new opportunities in expanding and deepening the content of interdisciplinary connections. Active use of connections between subjects in the learning process contributes to students' mastery of meta-subject skills in operating knowledge from different academic disciplines. The principle of metasubjectivity also involves teaching general techniques of mental activity, which are reproduced when working with any subject material.

Using a meta-subject approach through performing various tasks is possible in various lessons, including chemistry lessons. By completing such tasks, students ac-

quire natural science literacy, namely, develop skills in research and practical activities; gain experience in solving problematic, non-standard, creative problems. Thus, meta-subject chemical results include the ability to create, apply and transform signs and symbols, models and diagrams to solve educational and cognitive problems. In this case, mastering the language of chemistry, belonging to the group of subject results, is part of the meta-subject result indicated above.

The formation of meta-subject skills of students in the chemistry course of a basic secondary school is a complex process that requires a special organization of pedagogical conditions. As practice shows, teaching a chemistry course in a general education school does not ensure the development of meta-subject skills in schoolchildren. Based on the analysis of the research problem, the pedagogical conditions for the formation of meta-subject skills of students in chemistry lessons were identified. Clear identification and systematic diagnosis of the level of formation meta-subject skills with the help of special tasks is a necessary didactic condition for their achievement by each student.

When making thematic planning for a chemistry course (Approximate basic educational program. 2011), it is necessary to clearly present the position of each lesson in the overall system, clarify its role in solving the assigned educational tasks and achieving meta-subject results that can be identified by traditional means of control, i.e. through various tasks.

Thus, in lessons that form concepts about solutions (Approximate basic educational program. 2011), students must improve the following meta-subject skills: know the concept of “electrolyte”, the properties of electrolyte solutions; based on the diagrams in the text of the paragraph, explain the essence of the process of electrolytic dissociation and the role of water in it; learn to choose the level of difficulty within your capabilities, work on trust, keep track of time, independently operate a modular program, compare the results of your work with your goals.

Mastery of these skills contributes to the development of students' general educational ability to characterize the basic methods of studying natural science disciplines: observation, experiment, modeling. This requires the purposeful work of the teacher and systematic independent work of students to master ways of solving educational cognitive problems, the ability to explain the composition and properties of substances, and establish connections between observed phenomena and processes. Consequently, it is necessary to create a system of didactic tasks for mastering chemical content, ensuring the possibility of implementing a set of universal learning activities (UAL) at each stage of mastering.

In the chemistry course we are developing, an attempt has been made to build such a system of didactic tasks aimed at using generalized methods of activity and students creating their own products in mastering knowledge. For this purpose, their

typology was introduced and methodological features were determined, tasks of each type were compiled, used to work with the content of the paragraphs. Among them, we used contextual tasks, situational tasks, creative tasks and case technology. When completing such tasks, students demonstrate the following EUD: they set a goal, plan ways to achieve the goal, use various methods of searching for information, and also learn to act in conditions of uncertainty: to make a series of conclusions based on the information found.

To conduct a pedagogical experiment, two groups of 8th grade students of 25 people each studying chemistry at a basic level were formed: an experimental group (EG) and a control group (CG). Experimental work in them was characterized by an orientation towards various pedagogical conditions:

- in the CG, traditional forms of lessons were conducted, corresponding to the content of the main educational program and the calendar-thematic planning of the chemistry course;
- in the EG a set of pedagogical conditions was implemented. Meta-subject lessons were conducted using a system of didactic tasks on school course topics chemistry as a means of developing meta-subject skills.

To check the formation for meta-subject skills of students, we proposed individual and frontal questioning, questioning, problem solving, corresponding to the topic “Solutions” of the 8th grade chemistry course of a basic secondary school. The tasks are composed of questions that differ in their purpose. The work includes test tasks for choosing an answer, as well as tasks that require additional calculations and detailed documentation of the solution in a notebook. Each work contains tasks that check the formation of a certain group of UUD, as well as the level of formation meta-subject skills in general.

Contextual analysis of tasks for each group of universal learning activities made it possible to identify the strengths and weaknesses of students’ achievements. Each UUD group was represented in the integrated diagnostic work with several tasks testing different types of UUD. Students in the control and experimental groups show fairly high results (above 50%). The level of task completion by students from the EG for each criterion is slightly higher than that of students from the CG. Results of diagnostics of the level of formation meta-subject chemical skills allowed us to conclude that the majority of students are at a low level of success.

At the end of the study of the topic “Solutions”, a test was carried out in the experimental and control groups, containing a system of didactic tasks specially developed by us. The distribution of students by levels of success in the CG and EG is as follows: the number of students at a low level of success in the CG is 25% greater than in the EG; the number of students with a basic level in the EG is 16% higher than in the CG; and at a high level in the EG — 9% more than in the CG.

Analyzing the results we obtained, we came to the conclusion that the proposed didactic conditions are effective for developing meta-subject skills in schoolchildren.

It should also be noted that when working with a system of didactic tasks, students learn to apply subject knowledge in non-standard situations close to real life. Therefore, increasing the level of success when working with contextual, situational, creative and case tasks leads to an increase in the level of formation meta-subject skills.

The results we obtained in the control and experimental groups during the experimental work allow us to conclude that the formation of students' meta-subject skills proceeds more effectively when implementing a system-activity approach, the formation of students' meta-subject skills through the use of non-standard tasks in the educational process in chemistry, as well as when observing complex of pedagogical conditions for the functioning of this model.

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