



THE USE OF FORMATIVE ASSESSMENT IN CHEMISTRY CLASSES

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ABSTRACT

The article under discussion reveals the innovative methods of students' knowledge assessment. The authors of the article suggests development of a method for formative assessment in chemistry lessons and verification of its effectiveness. The authors believe that the organization of effective system of students' evaluation at chemistry lessons is possible only in creation of following conditions: complex introduction of technology of forming evaluation in structure of chemistry lessons; combinations in the course of training of evaluation with self- and mutual evaluation and activization of subjective position of the student.

KEY WORDS: *assessment, formative, students, chemistry classes, development, benefit, technology, evaluation, combination, element, disadvantages, learning material.*

DISCUSSION

Numerous researches conducted in our country show that the disadvantages of the school system of knowledge assessment include: a small range of school assessments; subjectivity of assessment and vagueness of its criteria; insignificant amount of controlled learning material for each student; lack of consideration of the weight of assessments; insufficient stimulation of active extra-program work of students; inability to assess generalized skills and personal results. All this required a change in approaches to the grading system.

The system of secondary education has the following requirements for the evaluation system. It has to:

- set out the objectives of evaluation activities: to focus on learning outcomes (subject, metadata, personal); to provide an integrated approach to evaluation; and to enable evidence-based management of the higher education system;

- record criteria, procedures, evaluation tools, presentation of results;
- to fix the conditions and limits of the assessment system application [2].

To overcome existing contradictions, an assessment system based on new technologies should be developed. One of such technologies is the technology of formative evaluation [3].

The term "formative assessment" was suggested in 1967 by Michael Skriiven in his work "Evaluation Methodology". The strategy of formative assessment was developed in 1998 by Dylan William and Paul Black [3]. In the interpretation of formative grading, most Western and Russian researchers (J. Harlen, L. Shepar, M.A. Pinskaya, I.S. Fishman, G.B. Golub, I.M. Ulanovskaya) are unanimous in defining the progress of a student, the current state of his learning, ways of prospective development, motivation, and planning new educational goals. Formative assessment is internal, carried out in the course of the learning process by students and the teacher. We adhere to the definition given by E.K.



Mikhaylova: "Formative assessment is the process of quality formation of individual educational achievements, aimed at timely provision of visual feedback in an integrated approach to learning" [3]. At the same time, all researchers note that the formative assessment is primarily aimed at the development of the student, the formation of planned learning outcomes, and thus consists in comparing his successes with their own previous achievements [2].

Before creating the instruction, it's necessary to know for what kind of students you're creating the instruction. Your goal is to get to know your student's strengths, weaknesses and the skills and knowledge they possess before taking the instruction. Based on the data you've collected, you can create your instruction.

The following activities are recommended to be used in the formative assessment:

- "Search for error." The trick is that the teacher intentionally gives students tasks with errors that they need to find. Mistakes made in the assignment should be typical, often made within the topic. For example, when studying the topic Limiting Hydrocarbons, after explaining the algorithm for naming alkanes, the following task can be given: "Find the errors in the names, write the structural formulas of substances and name them correctly according to IUPAC nomenclature: 3-methylbutane; 2-ethylpentane; 3-ethylpropane; 2-dimethylhexane; 2,2,3-methylbutane.

Such a task allows students to focus their attention on the following typical mistakes made when naming alkanes: wrong definition of the beginning of a chain, wrong choice of the longest chain, "loss" of numerals indicating the position of substituents, etc.

Thus, accomplishing the task will allow the teacher to solve two problems at once: to analyze students' understanding of the main ideas, the logic of accomplishing the task, and to prevent the most typical mistakes. This tutorial allows the teacher to assess both meta-subject and subject results, and in the latter case it is possible to mark one or two students for completing the task.

- Clarification of "why". The essence of the tutorial is that a law, theory position or definition is presented in four different ways: with a change in meaning, replaced by a deception, passed without change. Students must identify each case and explain why they think so. For example, in a lesson on "Limiting Hydrocarbons", after studying the concept of "homologues", pupils are presented with four definitions. Homologues are:

- compounds that differ into one or more CH₂ groups and have the same properties;

- compounds that differ into one or more CH₂ groups and have similar structure and properties;
- substances that belong to the same homological series;
- compounds that differ into one or more CH₂-groups and have a similar structure and properties.

Pupils who have assimilated the concept understand that the first definition is made with a distortion of meaning, the second one is changed with the preservation of meaning, in the third case there is a deception, and in the last case - the original definition. This technique helps to identify problems in understanding the material and errors in the logical reasoning of the student. In this case, the formative assessment is aimed at assessing subject and metrics results. The assessment can be made by both the teacher (and even by the respondent) and the students.

- Translation of information. This technique is for students to translate information (text into a table, graph or vice versa). As in previous cases, this involves analysing understanding of the material (subject matter results) and controlling the ability to translate one type of information into another (metrics results). The assessment is done by the teacher. For example, when studying the topic "The speed of a chemical reaction", students are given a graph on which the abscissa axis reflects the change in time and the ordinate axis reflects the change in concentration. The children who have mastered the topic should see that this is a graphical representation of the definition of the speed of a chemical reaction.

- Simplification. Pupils prepare a simplified paraphrase of the material, for example, for a child in primary school. The purpose of using this technique is to understand whether pupils understand the material, identify the errors that have occurred and correct them. This task can be given when studying a topic that has concentric development and continuity, for example, "Water", "Solutions". The task can be given to simplify the material about the unique properties of water, cycling, solubility factors, etc. The simplification format itself may be different - fairy tale, scribing, brochure, collage, laptop, etc.. Any simplification requires concentration on the most important, significant, as well as the selection of more understandable and accessible words to explain the concept, term, which do not distort the meaning and do not contradict the principle of science. The arrangement of information immediately "exposes" all the weaknesses of the topic. In this case, the subject matter and metrics are also assessed. The assessment is done by the teacher or students and can be marked for this work.



Let us look at formative assessment techniques that can be used after learning a complicated topic, section.

- **Memory Matrix.** The essence of the tutorial is that students are asked to fill in a table that covers important issues of the section. Guys should quickly fill in all the cells. It is desirable that the table was aimed not only at remembering the material, but also

to develop logical thinking of the child. At the stage of fixing the theme "Hydrocarbons", the following memorization matrix can be used (Table 1). When it is filled in, students need to remember the classes of hydrocarbons, which have a certain type of hybridization and are characterized by a specific type of isomeria.

Table 1
Isomeria and hydrocarbon hybridization

The type of isomeria	Hybridization		
	Sp3	Sp2	Sp
Carbon skeleton isomeria			
Isomeria of the critical position			
Geometric isomerism			
Isomeria of the mutual position of the deputies			
Isomeria between classes			

The reception is aimed at evaluating subject and metadata results. In the first case, the teacher counts the number of correct and incorrect answers and may grade some students or the entire class for their work. In addition, memorization matrices allow students to focus on typical errors within a topic.

- **Application Maps.** After studying the theory, principle or law, the assignment is given to describe one way in which this theoretical material can be applied in practice. After studying the big topic "The speed of a chemical reaction", pupils should enumerate situations, in which knowledge of theoretical material will be useful. For example, it can be used to slow down the deterioration of products, speed up the combustion process of firewood, and wash laundry more effectively. In this way, the subject and metrics results of the training are assessed (the ability to apply the knowledge gained in practice).

- **Squares.** The teacher creates a table of 4 squares: "Predict", "Explain", "Generalize", "Assess". The student chooses a square - a certain type of task to be performed. The task is performed orally. Let's give an example on the topic "Periodic system of chemical elements and structure of the atom". Pupils are offered: to predict the impact of discoveries in the field of the structure of the atom on understanding the Periodic Law and understanding the meaning of the ordinal number of the element, group and period; to generalize the prerequisites for the discovery of the Periodic Law; to evaluate the role of the Periodic Law in the development of chemistry; to explain how the properties of the atom and substances change by subgroup and period.

All considered methods of forming evaluation are effective only if they are used in the system, if different methods are alternated, actively involving students in the reflexion of results [4].

CONCLUSION

Assessment in education is an action to determine the importance, size, or value of gained knowledge and speech skills and subskills. The final purpose of assessment practiced in education depends on the theoretical framework of the practitioners and researchers, their assumptions and beliefs about the nature of human mind, the origin of knowledge and the process of learning. Assessment brings benefit to both the teachers and learners. By controlling the process of teaching, learners' knowledge, skills and subskills a teacher is able to work out new, more effective ways, methods of teaching a foreign language. Assessment helps the teacher to prove his ideas, methods on organizing teaching to foreign languages.

The organization of effective system of students' evaluation at chemistry lessons is possible only in creation of following conditions: complex introduction of technology of forming evaluation in structure of chemistry lessons; combinations in the course of training of evaluation with self- and mutual evaluation and activation of subjective position of the student.

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