

Methods of forming methods of mental activity of secondary school students  
when teaching chemistry

Salamov Ali Hasmagometovich

**Candidate of Pedagogical Sciences, Full Professor**

Kitieva Luiza Ibragimovna

**Candidate of Chemical Sciences, Associate Professor**

*Ingush State University, Magas*

Annotation. The current level of development of society, science and technology requires the preparation of a comprehensively developed young generation. The upbringing of such a personality is an urgent task of the Russian school. The solution to this problem occurs in the process of developing education, which is characterized by both the assimilation of the knowledge system by students and the development of their thinking and mental abilities.

The article discusses the methodology for the formation of methods of mental activity of secondary school students in teaching chemistry.

Keywords: mental activity, formation technique, technique, concept, chemistry, substance.

When studying a school chemistry course, students must master the system of methods of mental actions: the identification of essential features, recognition of concepts, comparison, generalization, the formation of methods of mental activity should be carried out in stages [1,2].

A correctly formed method of mental activity is a generalized knowledge of the method of action and the ability to use it. The modes of action by which mental activity is carried out can be expressed in a list of actions. The latter usually has the character of instructions or rules, recommendations indicating how to carry out mental activity, certain processes in solving problems [7].

In general, the methodology for the formation of methods of mental activity can be represented [7] as follows:

- firstly, the teacher shows the knowledge of the technique, explains why the student needs it;
- secondly, it is necessary that students use the appropriate theoretical knowledge when mastering the technique;
- thirdly, students' knowledge of the result of their actions;

- fourthly, students' independent application of this technique in solving new theoretical and practical problems.

Thus, the formed method has two sides: it is generalized knowledge about the mode of action and the possession of this method.

Let us consider how the formation of methods of mental activity occurs when studying a school chemistry course.

For the formation of the ability to identify essential features, students are introduced [1] to the mental operations included in the specified method: 1) highlighting the most common, basic feature;

2) highlighting those signs that show that this object, a phenomenon differs from similar ones, for example, explaining the presence of certain physical properties in metals, students note a common, basic feature inherent in all metals - the nature of a chemical metal bond. Based on this, they call those properties that distinguish metals from other substances - electrical conductivity, metallic luster, etc.

The next method of mental action is concept recognition. In this technique, the following mental operations can be distinguished: 1) identification of each main feature of an object, phenomenon; 2) establishing the presence in the object, the phenomenon of each of these signs from the system necessary.

Concept recognition tasks are composed as follows. Usually, students are offered a list of features that characterize an object or phenomenon, and their task is to determine which object or phenomenon is being discussed. For example, a list of signs is given: 1) the presence of electrons is characteristic; 2) there are positive ions in the nodes of the crystal lattice; 3) the presence of neutral atoms; 4) electrons bind all atoms (ions). On these grounds, the students conclude that we are talking about a metal bond.

If the students have learned to distinguish essential features, have mastered the methods of recognizing objects, phenomena, then they proceed [1] to the formation of the following method of mental activity of comparison in them. The essence of comparison as a technique is to compare objects in order to identify features of similarity or features of difference between them (or both together) [5].

This technique includes the following mental operations: 1) the definition of an object, phenomenon; 2) comparison of objects, phenomena, first according to the most general, basic characteristics; 3) comparison of objects, phenomena on those grounds that show the similarity or difference between objects, phenomena from similar ones; 4) establishing the similarity of objects, phenomena and determining by what signs or properties they are similar; 5) establishing

the difference between objects, phenomena and determining by what signs or properties they differ.

If the students have mastered the above methods of mental actions, then they form such a complex method as generalization.

From the point of view of logic, generalization is the construction (derivation) of universal statements from the epistemological and methodological points of view, the generalization procedure can be described as follows [5]:

1. Identification of signs common to the objects under consideration, properties, relationships, development trends, etc.

2. Establishing one common view on complex subjects.

The teaching method for this technique can be represented as follows [6]:

- 1) establishing a list of compared features based on the mental action of identifying essential features;

- 2) the implementation of the mental action of comparison;

- 3) generalization of the comparison results in the form of inference: a) on the basis of similarities or differences of objects, phenomena; b) according to the most essential features characteristic of a given subject, phenomenon.

If students are able to concretize the generalization made by them with examples, this indicates the development of their abstraction technique.

When carrying out such a mental operation as abstraction, students are guided by the following plan:

1. Establishing a list of common characteristic features for the substances proposed in the task.

2. Identification of essential signs (properties) of substances or phenomena.

3. Generalization in the form of a detailed conclusion, formulation of a rule, concept, law and concretization of generalization by examples.

To develop the ability to abstract, students are offered tasks in which they need to define a concept and give several examples, characterize a substance (phenomenon) from several different points of view, group substances, phenomena according to different classification criteria, for example:

1. Describe the given concepts: oxide, base, acid, salt from different points of view. Explain the answer.

2. Which of the compounds has alkaline properties to a greater extent: a) hydroxide of lithium, sodium, potassium; b) barium or zinc hydroxide. Why? What experiments can confirm the conclusions?

3. How much and what substances can be obtained with magnesium, water, hydrochloric acid, copper (II) chloride.

Tasks using the technique of abstraction contribute to the formation of various types of communication.

When generalizing disparate objects, phenomena are brought into a certain order, systematized.

The systematization of objects is a special case of classification, when features that are convenient for this purpose, but not essential for the objects themselves, are chosen as the basis.

By classification we mean a special case of using a logical operation of dividing the volume of a concept, which is a certain set of divisions (dividing a class into types, dividing these types into subspecies, etc.) [3,5]. Usually, signs that are essential for these objects, essential signs of similarity and difference between objects are chosen as the basis for division in the classification).

Here is an example of a task that allows for the classification [8]: "Divide the substances, the formulas of which are given below, into classes. Name the essential feature of each of them: P, HNO<sub>3</sub>, CuO, Cr<sub>2</sub>O<sub>3</sub>, Ca (OH)<sub>2</sub>, Na, N<sub>2</sub>O<sub>5</sub>, Cu, Zn (OH)<sub>2</sub>, HCl ". In this task, it is necessary to highlight the signs of similarity and differences in the composition of the molecules of substances and divide them into simple and complex. Complex, consisting of two elements, oxygen-containing and oxygen-free; oxygen-containing - on those in which the element is a metal or non-metal. That is, by carrying out the classification, we thereby divide the class into species, species for genera, etc.

As an explanation, let us take such a concept as "substance", which can be characterized as a class one. We get such a specific concept as "complex substances". Further implementation of the classification leads to a generic concept, for example "salt". It is distinguished on the basis of two features: the presence of an acid residue and metal atoms.

Such a mental division of concepts into narrower ones helps to better understand their essence, contributes to the development of the mental activity of students.

Thus, the systematic use of comparison tasks in the study of chemistry, the isolation of signs of similarity and difference in chemical processes, concepts, the ability to classify features corresponding to a given concept, abstraction from a number of properties and the ability to make inferences on some of them - all this leads to the activation of the PDU, the development of their logical thinking.

## References

1. Gavrusenko N.P. Using basic knowledge in the final topic of grade 8. - "Chemistry at school", No. 2, 1980.
2. Kabanova-Miller E.N. Psychology of the formation of knowledge and skills in schoolchildren. The problem of methods of mental activity. - M., APN RSFSR, 1962.
3. Kuznetsova L.M., Kimask G.A. Differentiated approach to teaching chemistry as a means of activating the PDU. L., Leningrad State Pedagogical Institute. A.I. Herzen.
4. Menchinskaya N.A., Morro M.I. Questions of methodology and psychology of teaching arithmetic in primary grades. - M.: Education, 1965.
5. Pidkasisty P.I., Korotyaev B.I. Theoretical foundations of teaching students knowledge and methods of cognitive activity. - "Modern Higher School", No. 3, 1980.
6. Talyzina N.F., Management of the process of assimilation of knowledge. - Moscow State University, 1975.
7. Philosophical Dictionary. Ed. Frolova I.T. - M, 1980.
8. Chernyak G.V., Kulikova L.V. Systematization and generalization of knowledge in chemistry in the evening school. - "Chemistry at school", No. 5, 1975.