Development of Logical Picture Thinking in Teaching Chemistry in an Innovative Educational Environment

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Abstract: This article highlights the issue of the development of logical and imaginative thinking of future chemistry teachers when teaching chemistry. The ideas about the effective use of the rules of logical imaginative thinking, repetition, elaboration, and consolidation of the material learned in the learning process are presented.

1 INTRODUCTION

In Uzbekistan, a modern educational process aimed at improving the quality of teaching chemistry, developing the student's mental potential, creative abilities and knowledge level, as well as effective research is being carried out. Currently, there are many opportunities in the field of education. In the world's leading scientific centres and higher education institutions, recommendations on the use of scientific developments in the educational process of the theoretical, methodological and methodological foundations of chemistry have been developed by specialists in the field based on the dependence of logical and figurative thinking. The methodology of teaching chemistry is closely related to the science of pedagogy. (Berdikulov, R. S.,2020).

2 THEORETICAL FRAMEWORK

Special terms are used to briefly express objects, events, concepts, and processes in the fields of knowledge, various production, movement activities, and teaching processes. (Abdiyev, M.,2022). The term plays a very important role in the study of chemistry. Chemical terms facilitate the interaction between teachers and students during training sessions, and help to simplify the definition of concepts when publishing chemical literature. For example, the term "AGGREGATE" is used in various fields. For example, in the field of chemistry, using the term aggregate, we define 4 states of matter: solid, liquid, gas, and recently widely used state of plasma aggregate. The wide and appropriate use of such terms will help the students of chemistry to think logically, intellectually, to communicate freely with the general public, and to interpret sentences scientifically. The terms are widely used, especially in chemistry.

Literature analysis. Today, the humanistic concept of education is introduced in modern schools in our society. Its introduction allows young people to use logical thinking and focus on developmental problems in educational processes, where it relies on the totality of teaching and development, and also takes into account the organizational laws of the process of learning chemistry. To determine the level of study of the problem we are interested in, we turn to psychological, pedagogical and methodical literature. This article covers the following: the

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importance of logical thinking in the mental development of a person in the process of studying chemistry and the possibilities of its use; the literal meaning of the concept of figurative thinking and the mechanisms of its formation; features of chemistry perception among teenagers are discussed.

According to the definition approved by today's modern cognitive psychology, thinking is a process of conscious activity of a person, characterized by a general and indirectly expressed image of action. Thinking in its broadest form constitutes human activity, which in turn creates its origins in human practice and takes many different forms. Also, the wealth of these forms is a product of the development of the thinking process. (Shavkatovich, B. R.,2017)

Thinking in relation to practical activity is divided into theoretical and practical types. Theoretical thinking is conceptual and figurative, and practical thinking is visual-figurative and visual-effective.

Types of thinking			
Theoretical		Practical	
Conceptual	Pictorial	Visual-pictorial	Visual-effective

Theoretical conceptual thinking (verbal-logical, abstract) is such thinking that a person who uses it does not pay attention to the experimental study of reality in the process of performing some task, does not perform practical actions aimed at the real formation of reality. He searches and discusses the solution of the task in his brain from the beginning to the end, using ready-made knowledge manifested in concepts, discussions, and conclusions. (Berdiqulov, R.,2022).

3 METHODOLOGY

The peculiarity of visual-effective thinking is that such a thinking process manifests a modified practical activity performed by a person with real objects.

Visual-image thinking is a process and a set of methods of visual solution of a task, which means imagining a situation with the eyes, and is designed to imagine objects without performing real practical actions. It allows for a more complete visualization of all the various facts-based properties of the subject. An important feature of this type of thinking is the setting of objects and their properties in an unusual unity. With this quality, visual-image thinking is inseparable from imagination. While thinking visually, a person is connected to reality, and expressions (images) necessary for thinking appear in short-term and operative memory.

This form of thinking is fully and widely described in children of preschool and junior school age, and in adults - among people busy with practical work. That is why the first successes in youth are on the side of figurative thinking, and the formation of a logical understanding of the world requires high activity of brain systems.

Theoretical image thinking differs from conceptual thinking in that it is not concepts, but images and expressions (images) that can be taken as material used by a person to fulfil a task, for example, visual images, that is why this type of thinking is also called visual thinking. During the performance of the task, these expressions (images) are separated from the long-term memory, and in some new situation, a person tries to see the solution of the task that interests him directly. This thinking continues and completes the process that started with visual-effective and visual-image thinking.

Visual-effective, visual-imagery and visual thinking together with themselves show a general system of representational forms, which can be called expressive (imagery) thinking. Accordingly, thinking by the way of describing reality can be divided into conceptual (logical) and figurative types.

All the above types of thinking compete with each other in terms of their level of complexity and their demands.

4 RESULTS AND DISCUSSION

Psychophysiologists discovered the functional asymmetry of the brain in the 1950s. This hypothesis was generally proposed by V. Rotenberg in the 90s of the 20th century, according to which: the left hemisphere of the brain receives information that directs to an unambiguous context - verbal behaviour, logical (mathematical, more precisely, unambiguous) thinking answers. The right hemisphere is responsible for intuition, imaginative thinking and controlled activity, and it also integrates all the numerous and even contradictory connections between environmental objects.

Historically, logical thinking, which is a type of thinking of the left hemisphere, is more developed and dominant in human society. The young child thrives under the increasingly active pressure of our left-hemisphere development. Today, there is a delay in the study of some figurative phenomena: for example, imagination, images, figurative thinking, etc. All schools are trying to form a clear context in

the student earlier, to develop the logical thinking of the left hemisphere. In understanding and memorizing the event, the student is required to logically understand what was read or said by the teacher and to be able to speak the memorized knowledge easily. Modern pedagogical practice, relying on verbal and logical thinking, occasionally refers only to visual-effective and visual-image types of thinking.

According to G.M.Chernobelsky, in recent years, the science of chemistry has to be shortened only and only. However, even then, teachers are not lowering the theoretical levels, because in their opinion, there is no basis for any science without theory, and the facts are presented in this regard. Experiences, practical training and information about scientists, etc. there is not enough time, more precisely, figurative thinking is leaving the practice of teaching. It is not for nothing that chemistry has become a kind of dry nonsense, and even students have lost interest in it.

By achieving dominance of the left-hemisphere thinking style, we ultimately limit the development of the individual, because not only emotional perception, spatial orientation, artistic thinking, but also creativity are related to the right-hemisphere thinking style. An inflexible, limited mindset cannot accurately reflect the ever-changing external world.

In education, the image levels of reality, intuition, hearing, and imagination are not taken into account in practical terms, and they, in turn, are considered as thinking of the past. In the 40s of the 20th century, J. Piaget formulated the law of hearing and assimilation of information, which consists of the following stages:

- Emotional stage (the stage of receiving information from the senses). At this stage, the more information a person receives about the object, the more imagination will appear.
- Marked (image) stage. At this stage, as in the first stage, expression is formed on the basis of information received from sensory organs.
- Logical stage. Understanding and understanding of the logical meaning of the information received in the image form of the second stage takes place.
- Linguistic stage. A person has the ability to express information with logical meaning in words.

These stages can be called the stages of the holistic thinking process. As a rule, logic is used after or at the same time as figurative presentation, but not separately. Violation of the order of information perception and processing stages causes inefficiency, inappropriate thinking, and misunderstanding among students. It is no wonder that many students clearly fall behind in their studies because the third, logical step of the thinking process is suddenly presented to them.

Methodical part. Here we consider the traditional method of creating formulas of substances by valency. When explaining the concept of "valency", almost all teachers immediately talk about the ability of atoms of an element to attach a certain number of other atoms to itself. They create the definition of "valency", several structural formulas, inform about the rule of creating valence formulas and mastering new material, offer students to complete a series of tasks to develop the skill of creating formulas of substances. Students actually only work with letter symbols. This approach, based on the application of logical thinking, is carried out at the limit of the rise from the particular to the general, allowing the use of a standard algorithm - the method of constructing a substance formula by valence. The disadvantage of this method is that it cannot be used for children controlled by the right hemisphere.

Observations show that in this case, many students find it difficult to remember the rules for forming the formulas of substances in a short time, and then have to memorize it again and again. As a result, it takes a long time for this rule to remain in memory.

The teacher is connected with the learning process of students who think differently, and the traditional method does not allow to "see" the desired chemical phenomenon at the macro- and micro-levels from different angles, but instead directs to rely on symbols. The right-hemisphere method moves from the general to the specific in logic, relying not only on logical, but also on expressive forms of thinking. At first, it is necessary to draw pictures of combinations of atoms or work with atomic models, to illuminate various hypotheses (creating perceptual expression). Models and pictures of atoms of different chemical elements should be completely different in size, colour, and symbols.

Then it is possible to consider the methods of thinking about the studied science (creating a visual expression of the phenomenon), simplifying chemical terms, telling (creating a verbal expression), and only then working with symbols (symbolic expression), as well as creating formulas. This method is not algorithmic, but based on common sense.

5 CONCLUSION

As a conclusion, logically thinking children can use the recommended standard algorithm, and with this

approach, right-hemisphere children can also create their own way of creating formulas by comparing them with the memory expression.

The main structural unit of figurative thinking is an expression - an image, which describes the spatial properties of the perceived object and records the results of the thinking process. Thinking in images shows a complex mental process of re-forming, processing and imaginatively reorganizing sensory information. In the process of thinking, the image performs a specific task not by itself, but in a complex composition. Such tasks include - planning, forecasting, correcting; these, in turn, ensure not only the reception of the given information, but also the new one - which was not created before or did not exist at all.

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