THE METHOD OF ANALOGY IN THE STUDY OF BIOLOGY IN GRADES 10-11

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Abstract. Analogy is one of the most effective methods in teaching schoolchildren. The ability to interest in the study of a subject, motivate for new scientific discoveries, innovation is the main merit of the educational analogy. This technique contributes not only to the updating of knowledge, but also to a more effective generalization, systematization and study of new material.

Keywords: analogy, pedagogy, biology, knowledge, living systems.

In modern education, the system of methods of student activity includes modeling, highlighting the main thing, classification, transfer, analysis, concretization, synthesis, observation, generalization, comparison and, of course, analogy.

The methodology of applying analogy in the process of teaching concepts is a program of such actions by teachers and students with terminology that provides students with a high level of mastery of them, characterized by their understanding, the ability to consciously apply them when solving problems and navigate with their help in changed conditions [1].

In such an action program, the main link in the application of analogy can be identified and described, which determines the direction and main purpose of this process, as well as its individual stages and actions that make up its structure.

Based on the analysis of literary sources, two main aspects of the application of the analogy method can currently be distinguished:

1. The analogy method is used in teaching as a technique for visualizing complex and visually unimaginable objects and phenomena.

2. A more important aspect, which is extremely rarely used, is the use of the analogy method as a basis for transferring knowledge from one science to another. That is, it is used as a tool when climbing the pyramid of knowledge [2].

Establishing analogies requires students to make comparisons. By comparing objects, phenomena, and processes, a person gets the opportunity to think deeper, and his knowledge becomes more solid and meaningful. The comparison allows students to form the ability to find similarities and differences of concepts, processes, phenomena, which activates mental activity and accelerates the process of mental development.

Comparison is carried out in two main forms: comparisons and oppositions. The juxtaposition is aimed at clarifying the distinctive in objects and phenomena while highlighting essential features and properties. The comparison is aimed at highlighting the essential properties common to a number of objects. As practice shows, it is easier for a student to find a difference than a similarity [2].

Analogy helps students to find a presumptive solution to new questions, educational problems and thereby contributes to the activation of the cognitive process, the teaching of schoolchildren, the effective development of their independent productive thinking, biological intuition. Analogies, in addition, are the most important source of associations that ensure deep and lasting assimilation of the subject by students [3].

Using successful analogies allows you to achieve much greater clarity. At the same time, the ease of assimilation and memorization of the material increases many times due to the inclusion of associative thinking. On the other hand, it is simply impossible to do without using analogies if an abstract subject is being presented, which must be visualized in some way so that a listener with not too developed abstract thinking understands the meaning of what is being presented. In other words, if the phenomenon is too complex or impossible to visualize, use the analogy method.

Here are some examples of analogies that can be used in the study of biology.

1. A complete analogy of the structure of the stems of cereals and modern high-rise buildings. The stems of cereal plants are able to withstand heavy loads and at the same time not break under the weight of the inflorescence. If the wind bends them to the ground, they quickly regain their vertical position. What is the secret? It turns out that their structure is similar to the design of modern high—rise factory pipes - one of the latest achievements of engineering.

2. The body of deep-sea sponges of the genus Euplectellas has high-quality optical fiber. According to the test results, it turned out that the material from the skeleton of these 20-centimeter sponges can transmit a digital signal no worse than modern communication cables, while natural fiber is much stronger than human due to the presence of an organic shell. The skeleton of deep-sea sponges of the genus Euplectellas is constructed of high-quality optical fiber [2].

3. The design of the Eiffel Tower is based on the scientific work of the Swiss professor of anatomy Herman von Meyer. 40 years before the construction of the Paris engineering miracle, the professor studied the bone structure of the femoral head at the place where it bends and enters the joint at an angle. And yet, for some reason, the bone does not break under the weight of the body.

The base of the Eiffel Tower resembles the bone structure of the femoral head [4].

Comparisons of complex biological and chemical processes with various situations from everyday life perform various functions: they provide an opportunity to imagine what is impossible to see in school conditions, serve as a means of discovering new patterns, explain some phenomena, help to remember complex scientific concepts and understand their essence. The analogy method makes lessons more interesting, diverse, and the learning material more understandable and understandable.

4 classes were selected for the pedagogical experiment: 10 A, B; 11 A, B. At the same time, classes with the letter "A" were experimental groups in which the method of analogy was used in biology lessons, and "B" were control groups. In the 10th grades, the experiment occurred during the study of the topics of the section "Living systems and their study", and in the 11th grades "Living matter as a system".

The experiment in 10th grades showed the following results (Diagram 1):

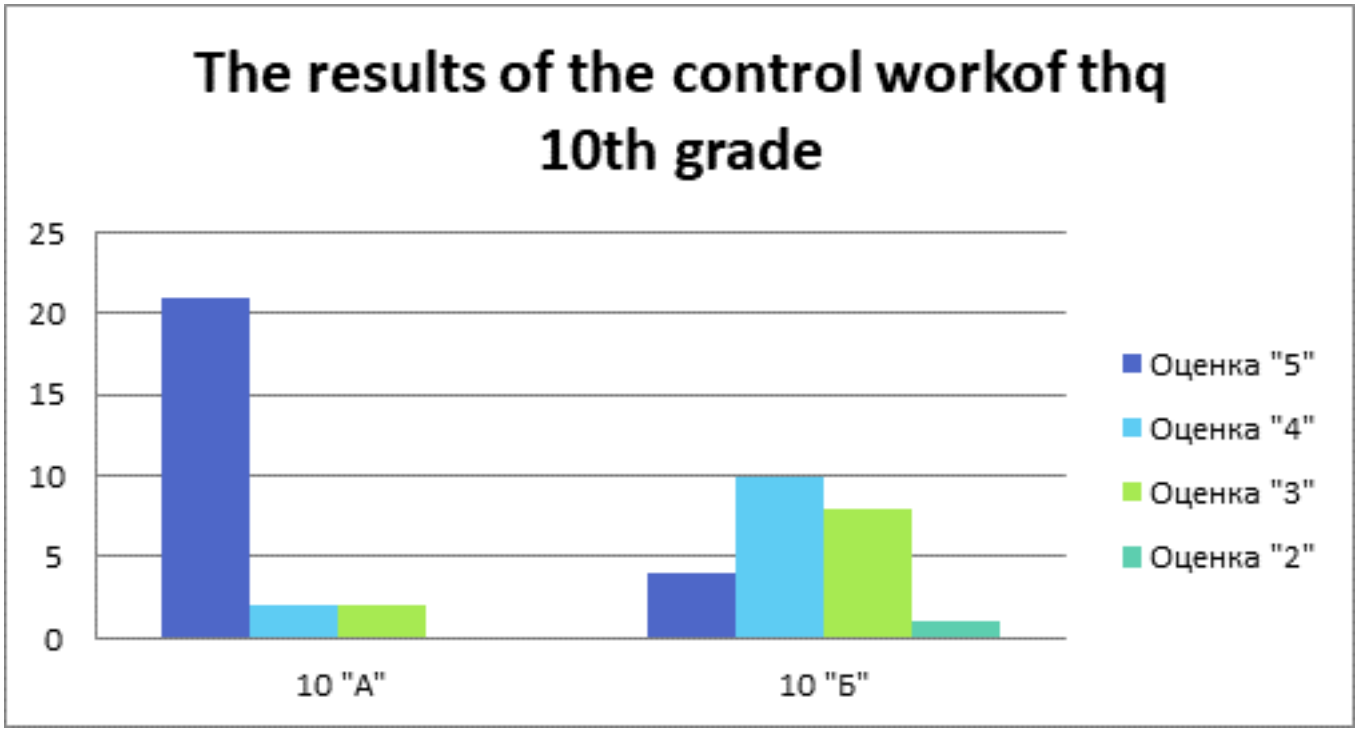

Figure 1. The experiment in 10th grades showed the following results

The section "Living systems and their study" is devoted to 2 lessons of studying new material. We added 1 control lesson to determine the parameters of the experiment. It was found out that the use of the analogy method in the 10th "A" class shows a high level of assimilation of knowledge. The children actively participated in a dialogue with the teacher about the properties of living systems, gave examples and independently built analogies on the following properties, understanding the structure of the method. In the lesson on the levels of organization of living systems, children drew up diagrams using the analogy method, which they associated with a specific level and easily moved on to the next one without the help of a teacher.

In the case of the 10th grade, the teacher used standard methods of explaining new material. The children participated in the conversation, but only when the simplest properties of life were discussed. For example, the properties of discreteness and integrity caused difficulties for children. The levels of organization of living systems were somewhat more difficult for children, due to the fact that the teacher used more complex scientific terminology. In control lessons in grade 10 "A", children showed a high level of learning: 84% - grade 5; 8% - grade "4"; 8% - grade "3"; there are no unsatisfactory grades. In the 10th grade, the quality of knowledge in this section showed a lower result: 17% - score 5; 44% - score 4; 35% - score 3; 4% - score 2

The experiment in 11th grades showed the following results (Diagram 2):

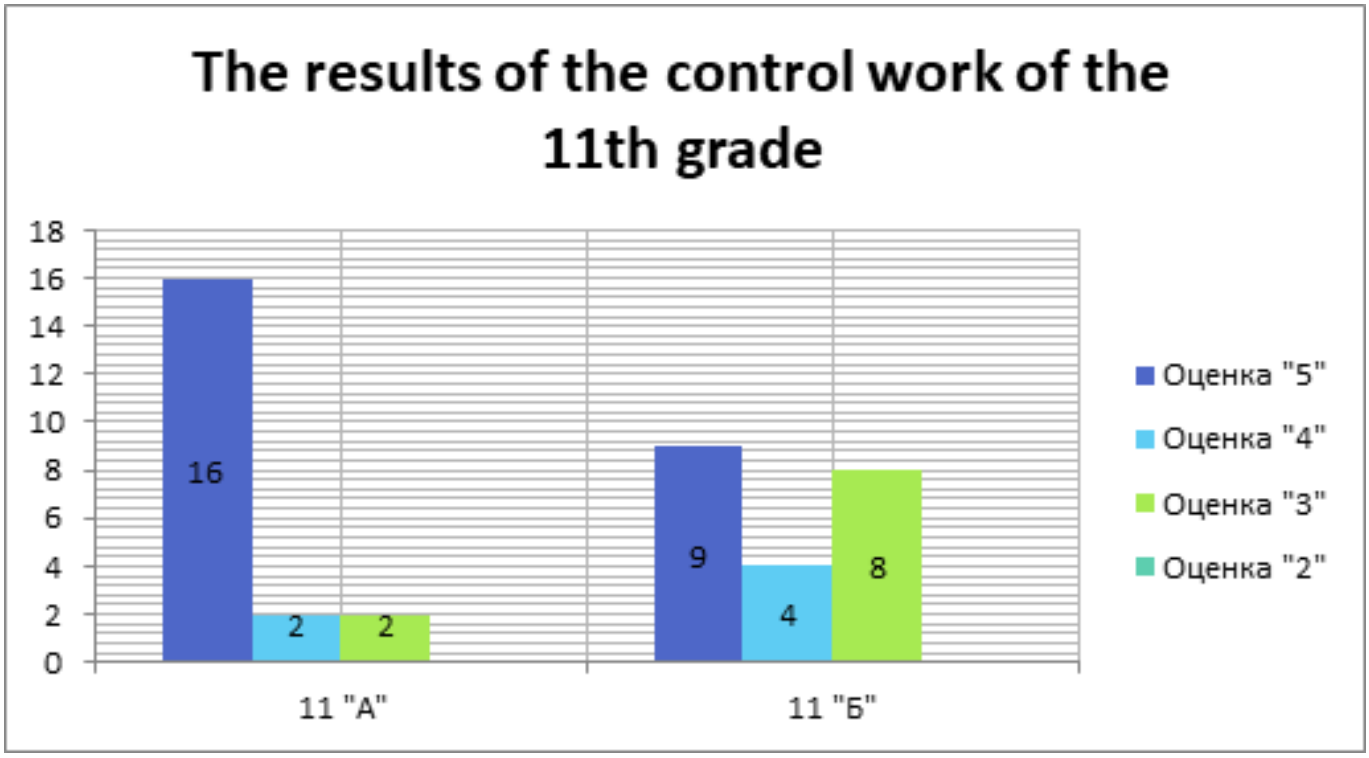

Figure 2. The experiment in 11th grades showed the following results

The section "Living matter as a system" is devoted to 5 lessons of studying new material. We added 1 control lesson to determine the parameters of the experiment. In the 11th "A" grade, the following results were revealed: 80% - grade 5; 10% - grade 4; 10% - grade 3. In grade 11 "B", the results are as follows: 43% - grade 5; 19% - grade 4; 38% - grade 3. Unsatisfactory grades in both classes are not recorded.

Thus, we conclude that the analogy technique is highly effective for learning. Personal analogy frees students from a mechanistic, external analysis of the problem. Direct analogy requires the student to activate his memory, turn on the mechanisms of analogy and identify in human experience or in the life of nature the similarities of what needs to be created.

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