

HOW DOES THE CASE STUDY METHOD DEVELOP THE ANALYSIS AND SYNTHESIS SKILLS OF 7TH GRADE STUDENTS IN BIOLOGY LESSONS?

Key words: case study, skills, synthesis, analysis, biology.

Annotation

At Nazarbayev Intellectual Schools, teachers emphasize high-order skills development in their lessons. The development of analysis and synthesis skills in the classroom takes place through various teaching methods and strategies. Every year, schoolteachers determine the goal of pedagogical development. A research question is formulated for this purpose.

The article discusses the impact of using case study methodology on the development of analysis and synthesis skills in 7th grade students in biology lessons, during which the pros and cons of using this methodology are considered. A comparative analysis of the effectiveness of students' perception of the material when conducting a lesson using the case study methodology and a traditional lesson is provided.

The experience of using case study methodology in biology lessons will be useful for teachers who plan to use this method in the future to develop analysis and synthesis skills during lessons and adapting the case study methodology to their classes.

In the lessons of the natural-mathematical cycle, students always have difficulties when completing assignments with questions aimed at developing the skills of analysis and synthesis. Many students, when completing tasks aimed at analysis and synthesis, need teacher support in the form of additional tips, clarifying questions, and providing analogies or examples. Analysis and synthesis skills are the highest order skills in Bloom's taxonomy.

Analysis is the structuring of information, breaking it into blocks, comparing and isolating what is important. Analysis is a skill that is used to accept ideas and find ways to solve problems [1].

Synthesis is the ability to assess a situation from different (often incompatible) points of view and combine them, realizing new possibilities [2].

To solve this problem, we asked ourselves: "What method can be used to develop students' analysis and synthesis skills in biology lessons?"

Having studied various methods for developing analysis and synthesis skills, my colleagues and I chose the "Case study" method to solve this problem.

The case-study method or the method of specific situations (from English case - case, situation) is a method of active problem-situational analysis, based on learning by solving specific problems - situations [3].

A case is a problematic situation offered to students as a task to analyze and find a solution [3].

The Encyclopedia Britannica describes a case study as a detailed description and assessment of a specific real-world situation designed to extract generalizations and other ideas from it. A case study may concern an individual, a group of people or an organization or event [4].

By focusing on a specific subject in its natural setting, case studies can help improve understanding of broader features and processes in learning.

Data in a case study can be either qualitative or quantitative. Unlike experiments in which researchers control and manipulate situations, case studies are considered "naturalistic" because subjects are studied in their natural context.

The most challenging task is to find something unique that others have not discussed before. This is why students repeat each other. It is normal for them to present the same topic in diverse ways. The problem is that students may plagiarize. So, how do you choose the right topic in a case study in the subject biology for students [5]?

1. Search multiple sources on a specific topic.
2. Choose reputable sources.
3. Brainstorming.

The case includes the following:

1. Storyline - a problem, incident, or life story.

2. Methodological part – questions and tasks for working with the case.

3. Information part – applications in the form of articles, Internet resources, etc.

Work on the case includes the following stages:

- Preparatory stage - developing a case study for a lesson for a specific learning goal, searching for material and developing questions and assignments for students.
- During the lesson - students are introduced to the case, discuss the situation, and form groups.
- Analytical stage – familiarization with evaluation criteria, group analysis of the situation, search for solutions, study of information, discussion in groups, presentation of results, results of the solutions found.
- Result – presentation of the group’s analytical results, summing up and drawing conclusions on the case.

During the lesson, work on the case consists of the following stages:

1. Introductory stage - at this stage, students become familiar with the case and are involved in a discussion of the situation.
2. The main stage - involves the work of students in groups. Working in a group is the development of a common solution, which is accompanied by graphic organizers.
3. Presentation is the author’s product of the group with the subsequent formulation of conclusions.

Lessons using the case study methodology were conducted in the 7th grade for two learning objectives: “Determining the importance of movement in the life of organisms” and “Explaining the importance of sleep in restoring the life and rest of the body.”

In the first lesson, students were given the following case:

- Introductory stage:

Text: “In the 2015 cartoon, ‘The Good Dinosaur’, in one of the scenes the snake was depicted with four legs.

Modern pythons have preserved the rudiments of the pelvic girdle and hind limbs. The external rudiments of the hind limbs are clearly visible in the form of claws between the body and tail.”

- The main stage consisted of the following questions and tasks:

Questions:

1. What biological process is discussed in the text?
2. What problems or processes led to these changes?

Solved problems:

1. How do modern snakes move?
2. What organs are involved in the movement of snakes?
3. What is the reason snakes got rid of their legs?
4. How can humans use the modern way snakes travel to their advantage?

• Presentation: Groups defend their work in the form of a poster with a graphic organizer and formulate conclusions about the case.

In the study group, the “Case study” method was used; the total number of students who took part in this group was 13. In the control group of 13 students, lessons were conducted in a traditional format.

At the first lesson in the study group, students, after reading the text, answered questions and solved problems about the case. The groups worked with links suggested by the teacher. When answering the case questions, many students gave the following answers:

1. During the process of evolution, snakes lost their limbs.
2. The process of genetic mutation helped snakes get rid of their limbs.

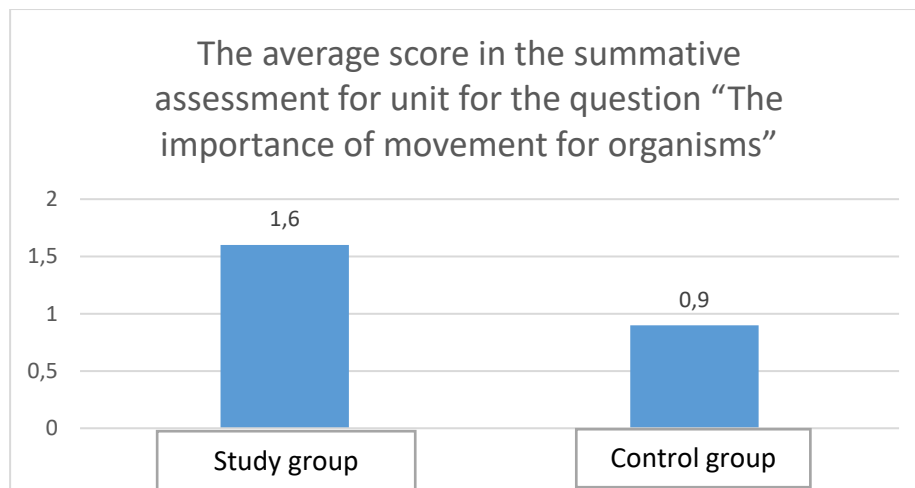
The groups proposed the following solutions to the problems posed by the case:

1. Snakes crawl and move their bodies using skeletal muscles.
2. Contraction and relaxation of skeletal muscles.

When answering the questions of problems 3 and 4, which were aimed at analysis and synthesis skills, students gave the following answers:

3. Crawling between bushes, with little space between them, led to regression of the limbs.
4. Creation of robots to save people when buildings collapse, as well as to repair cars without using a jack to lift it.

Dynamics of indicators based on the results of the assessment “Determination of the importance of movement in the life of organisms” of 7th grade students.



In the study group, the average scores for completed tasks were higher by 0.1 points compared to the control group. In percentage terms, in the study group the percentage of correct answers was 87%, and in the control group – 83%.

In the second lesson, students were given a case:

• Introductory stage:

Text: “In the evening, Kozhanasyr left the house and went for a walk. At this time, he encountered a patrol officer who was inspecting a water-filled ditch:

- “Kozheke, what are you doing at night in the field?” - He said.

Kozhanasyr:

“I lost sleep, so I walk around and want to catch it,” he said.”

• The main stage consisted of the following questions and tasks:

Questions:

1. What problem is discussed in the text?

2. What are the causes of this problem?

Solved problems:

1. What is sleep?

2. What conditions are necessary for good sleep?

3. What is the effect of good sleep on human health?

4. How can people use the sleep state during long flights in space?

Presentation.

In the study group, the students, having familiarized themselves with the case, began to work. The groups worked with Internet sources. When answering the case questions, many students noted the following:

1. The text talks about the problem of insomnia.

2. Stress, worries, mental work, or illness.

The groups proposed the following solutions to the problems posed by the case:

3. Sleep is a physiological state of a person in which he does not react to external stimuli.

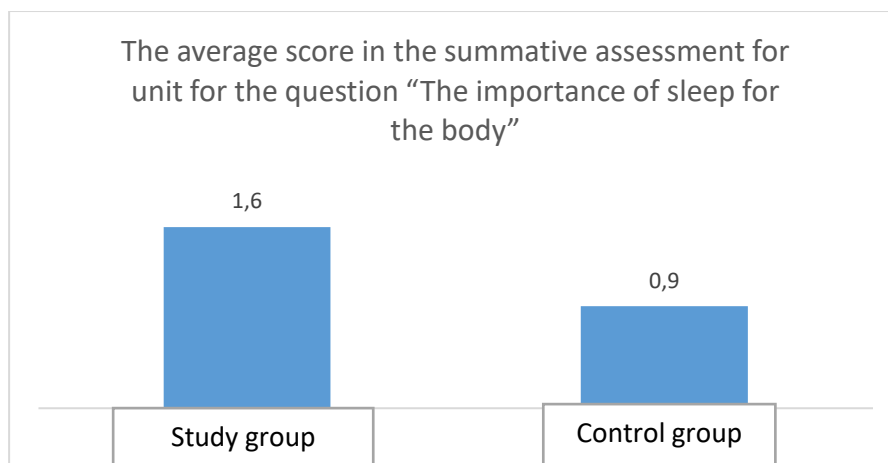
4. Clean bed, personal hygiene, do not overeat and walk in the fresh air.

When answering questions in problems 3 and 4, aimed at skills of analysis and synthesis, students noted the following:

5. Positive emotions throughout the day, restoring the body’s energy, improving immunity and metabolism.

6. Anabiosis – cessation or slowdown of life processes. This process will help people endure long flights in space in special capsules without harming the body.

Dynamics of indicators based on the results of the assessment “Explaining the importance of sleep in restoring the vital functions and rest of the body” for 7th grade students.



In the study group, the average score for completed tasks in the summative assessment was higher by 0.7 points compared to the control group. As a percentage, in the study group the percentage of correct answers was 80%, and in the control group - 40%.

A survey was conducted among students in the study group to determine the effectiveness of using the “Case study” methodology; the survey results showed that conducting a lesson using this methodology and gaining knowledge was useful for students.

When conducting lessons using the “Case study” methodology, it was found that students were interested in this lesson format. Based on the students' responses, we found that the students were learning the material well. Most students found these lessons useful for developing higher order skills.

When conducting lessons using the “Case study” method, it was noted that students feel confident in the lessons when performing tasks related to the case and can understand the data obtained and synthesize innovative solutions. Students in the survey noted that classes using the “Case study” method in the future will help them apply knowledge in further education.

In conclusion, it can be noted that the “Case study” methodology in the 2023-2024 academic year showed its effectiveness in developing students' analysis and synthesis skills, which in turn influenced the positive dynamics of growth in the quality of academic performance in the studied groups. Thanks to this technique, 7th grade students analyzed the information received and synthesized innovative ideas to solve problems posed in the lesson.

After conducting the research, we concluded that this technique is an effective training system. It is relevant when conducting non-standard lessons because a lesson conducted using this method increases students' interest in acquiring knowledge and helps develop analysis and synthesis skills.

As a result of the study, pros and cons were identified:
positive aspects of using the “Case study” methodology:

- deepening the decision-making process;
- gives analogues;
- formation of strategic thinking;
- ability to conduct evidence-based debate.

negative aspects of using the “Case study” methodology:

- a lot of time is spent preparing the case;
- difficulty in developing a case.

The “Case study” technique shows effectiveness in developing analysis and synthesis skills. We plan on carrying out the “Case study” methodology in the future, based on today's realities and relying on the experience of teachers, adapting it to biology classes.

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