

METHODOLOGY FOR USING THE TIMSS INTERNATIONAL ASSESSMENT PROGRAM IN BIOLOGY LESSONS

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ANNOTATION: This article highlights the role of the TIMSS international assessment program in teaching biology and the methodology for integrating it into the learning process. The TIMSS program's approaches to knowledge analysis, practical orientation, and the development of creative thinking are used in the effective organization of lessons. The article provides practical recommendations for improving the scientific and creative potential of students, laboratory sessions, and a lesson plan that meets the TIMSS requirements for biology lessons. This methodology ensures the competitiveness of students in assessing their knowledge at the international level.

KEYWORDS: TIMSS, biology, international assessment, student knowledge level, creative thinking, laboratory sessions, methodology, lesson plan, international educational standard.

TIMSS (Trends in International Mathematics and Science Study) is an international study organized every four years, aimed at assessing students' knowledge and skills in mathematics and natural sciences. It has been implemented by the IEA (International Association for the Evaluation of Educational Achievement) since 1995 [1].

The primary objective of TIMSS is to:

Assessment of students' knowledge: International comparison of the level of knowledge in mathematics and natural sciences among fourth and eighth graders.

2. Analysis of the education system: Studying the specifics of each country's education system and identifying its strengths and weaknesses.

3. Development of educational policy: Developing recommendations for improving the quality of education based on the results.

TIMSS has several implications today:

1. It allows for an international comparison of the level of knowledge among students in countries.

2. It helps to identify successful strategies in the learning process.

3. Provides information on the quality of education for teachers, parents, and policy makers [2].

The number of participating countries in TIMSS is increasing every year, as it is an important tool in defining global standards of education. Uzbekistan participated in the TIMSS study for the first time in 2019, which allowed for an assessment of the role and level of the national education system in the international arena.

The primary goal of the modern education system is not only to provide students with theoretical knowledge, but also to develop practical skills and determine the level of knowledge through global assessment systems. In this regard, the TIMSS (Trends in International Mathematics and Science Study) international assessment program is of great importance. TIMSS employs innovative approaches to assessing students' knowledge of natural sciences and mathematics. This article examines the methods of using the TIMSS program in teaching biology and its methodological significance [3].

The TIMSS international assessment program allows for an international comparison of the knowledge of 4th and 8th grade students in mathematics and natural sciences. This program works in the following areas:

knowledge analysis - knowledge of fundamental concepts and rules;

practical orientation - assessment of the level of students' ability to apply their knowledge in everyday life;

developing thinking is the development of analytical and creative thinking skills.

TIMSS tests serve as an important tool not only for assessing knowledge, but also for determining the scientific and creative potential of students.

The following pedagogical goals can be achieved through the use of TIMSS tests in biology:

1. Knowledge deepening: The complexity of TIMSS questions encourages students to strengthen their theoretical knowledge.

2. Strengthening practical exercises: Test assignments are based on real-life examples and can be used in laboratory sessions.

3. Developing Creative Thinking: TIMSS requires learners to identify similarities, logically analyze, and draw conclusions [4; 5].

There are several ways to integrate TIMSS tests into biology lessons. These tests assess students on three levels:

Knowledge level - knowledge of basic concepts and rules.

The level of application is the application of biological knowledge in everyday life.

The level of analysis is the solution of complex problems.

During the lesson, the teacher must prepare assignments taking into account these levels and convey them to the students.

Using TIMSS questions in laboratory work:

Example: Tasks such as "Explain the main stages of the photosynthesis process through practice" will help to study biological processes in practical laboratory classes [6].

Discussion and analysis lessons: Organizing discussions among students using questions based on TIMSS tests develops their skills in conducting scientific discussions. Example: Questions like "What is the impact of humans on the evolution of organisms?" encourage students to analyze global problems.

TIMSS has several advantages:

1. Making students internationally competitive: TIMSS tests help prepare students in line with international standards.

2. Making lessons interactive and interesting: With the help of life and creative questions, it is possible to increase students' interest in lessons.

3. Teacher Professional Development: The TIMSS methodology requires teachers to apply new pedagogical technologies.

Below is an assignment from biology, adapted to the TIMSS international assessment program for photosynthesis and respiration. This assignment is designed to test students' knowledge and assess their scientific thinking and analytical abilities [7; 8].

Question 1. Facts and knowledge (simple level):

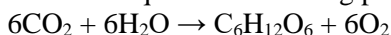
What substances do plants consume and produce during photosynthesis?

1. Substance consumed by plants:

2. Substance produced by plants:

Question 2. Application (average level):

Here's an equation describing photosynthesis:



What is the purpose of the glucose produced in this process in the plant organism? List at least two goals.

Question 3. Analysis and discussion (complex level):

In one classroom, students conducted an experiment to explain the process of photosynthesis. They held the green leaf in the sun for several hours, then treated the leaf with a solution of iodine to determine if it contained starch.

Describe and explain the color change of a leaf as a result of this experiment.

If the experiment were conducted in the dark, what would be the result? Why?

The above 3 difficulty level task evaluation criteria are:

1. Question 1: The correct answer is carbon dioxide (CO₂) and water (H₂O) are consumed, oxygen (O₂) and glucose (C₆H₁₂O₆) are formed. 1 point for each correct answer.

2. Question 2: Glucose is used to produce energy (inhalation), synthesizing cellulose, which is an integral part of the cell wall. 2 points for each correct answer.

3. Question 3: Experimental results: a leaf held in the sun, after treatment with a solution of iodine, changes to a bluish-dark green color (there is starch). In the dark, color changes are not observed (starch is not synthesized). Up to 3 points per explanation.

This assignment is designed to test knowledge at different levels based on TIMSS requirements. The teacher can analyze the results and determine in which direction the students need help.

Conclusion. Using the TIMSS international assessment program in biology lessons not only develops students' knowledge and skills, but also enhances their logical and creative thinking skills. By effectively using TIMSS tests, the teacher can ensure that students are prepared to solve problems on a global scale. Therefore, the widespread introduction of TIMSS methodology into the educational process

is one of the pressing issues.

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