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LEVEL OF COMPLEXITY AND SCOPE OF TIMSS TASKS

Annotation.TIMSS (Trends in International Mathematics and Science Study) is an international study that evaluates the level of knowledge of mathematics and natural sciences of students in different countries of the world. This study examines differences in student learning, teaching styles, and educational system quality. TIMSS tasks are distinguished by their level of complexity and scope, as they test not only knowledge, but also analytical and practical skills.

Key words:low complexity, medium complexity, high complexity, factual knowledge, conceptual understanding, procedural skills.

Level of Complexity. TIMSS tasks are designed to assess students' knowledge and skills at different levels and are divided into three main levels of complexity:

1. Simple level: Tasks at this level mainly require knowledge of facts and the ability to perform simple operations. For example, simple arithmetic calculations or retelling tasks of scientific concepts.
2. Intermediate: These tasks require the ability to analyze, apply concepts, and solve problems. Students need to understand logical reasoning, observation, and cause-and-effect relationships.
3. Complexity: High-level assignments require creative thinking and high-level analytical skills to solve problems. These tasks usually consist of several stages and encourage students to apply theoretical knowledge in practice.

Scope. TIMSS tasks are comprehensive in mathematics and science and include the following areas:

1. Mathematics:

Number and algebra: Arithmetic operations, algebraic expressions, equations and inequalities.

Geometry: Working with shapes and spaces, dimensions and angles.

Statistics and probability: Data analysis, graphs and probability problems.

2. Natural sciences:

Physics: Forces, energy, motion and electrical phenomena.

Chemistry: Composition, properties and chemical reactions of substances.

Biology: Living organisms, their structure and life processes.

Earth and Space Sciences: Earth's structure, atmospheric processes, and space phenomena.

Challenges and Advantages for Students. TIMSS tasks allow students to demonstrate their knowledge of specific subjects. At the same time, the high level of complexity of the tasks helps students to learn more deeply and develop higher-level problem-solving skills.

TIMSS tasks are presented in two main forms:

Examples of TIMSS Assignments. Tasks given within the framework of the TIMSS study are aimed at assessing the level of students' knowledge of mathematics and natural sciences. Below are some examples of math and science subjects used in the TIMSS survey:

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Examples of Mathematics

1. Numbers and Arithmetic Operations:

Question: The revolving game center has 4 different attractions. If a student wants to ride all the attractions once, how many times should he ride in total?

Answer: 4 times.

2. Geometry:

Question: The lengths of two legs of a right triangle are 6 cm and 8 cm. Calculate the length of the hypotenuse of the triangle.

Answer: 10 cm (Pythagorean theorem: 62+82=1026^2 + 8^2 = 10^2).

3. Algebra:

Question: Find the value of xx for the equation 3x+5=203x + 5 = 20.

Answer: x=5x = 5.

4. Statistics and Probability:

Question: The following table shows the number of students and their sports. Calculate the percentage of students who play basketball in relation to the total number of students.

Answer: When calculating the percentage, the calculation is made based on the necessary data.

Examples of natural sciences

1. Physics:

Question: If an object is falling freely, how many meters does it travel in 2 seconds? (free fall acceleration g=9.8 m/s2g = 9.8 \, m/s^2)

Answer: s=12gt2s = \frac{1}{2} g t^2, s=12×9.8×22=19.6s = \frac{1}{2} \times 9.8 \times 2^2 = 19.6 meters.

2. Chemistry:

Question: What is the chemical formula of water?

Answer: H2OH_2O.

3. Biology:

Question: How do plants make their food?

Answer: Photosynthesis.

4. Earth and Space Sciences:

Question: What is the largest planet in the solar system?

Answer: Jupiter.

Examples of Open Answer Assignments

1. Mathematics:

Question: The volume of a cone is calculated by the formula V=13pr2hV = \frac{1}{3} \pi r^2 h. Find the volume of a cone with a radius of 5 cm and a height of 12 cm.

Answer: V=13p×52×12=100pV = \frac{1}{3} \pi \times 5^2 \times 12 = 100 \pi cubic centimeters.

2. Natural Sciences:

Question: What gases are most common in the Earth's atmosphere? Explain the main functions of these gases.

Answer: Nitrogen (78%), oxygen (21%). Nitrogen plays an important role in plant growth, and oxygen is necessary for respiration.

These examples represent tasks at different levels of the TIMSS survey. They are designed to evaluate students' skills in applying theoretical knowledge in practice.

Summary

TIMSS tasks are an important tool for assessing the quality of education, and their level of complexity and scope test not only students' knowledge, but also their analytical thinking and problem-solving

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skills. These assignments serve as a guide for teachers to improve their textbooks and improve student achievement.

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