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TIMSS INTERNATIONAL TEST DEVELOPMENT PRINCIPLES

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Annotation: This article discusses the mission of the TIMSS program and the subject assessment processes. This program, which assesses math and science literacy, describes the purpose and testing procedures. Assignments should be made based on age characteristics, the answers to the tests should be clear. It also tells about the test production principles of the program

Key words: TIMSS, mathematical literacy, science, test, task, content, problem, reflection

The experience of participation in the international study of educational achievements of schoolchildren of our country helps to update the content of educational programs. Recognized by the international educational community, the International Mathematics and Science Study (TIMSS) program assesses the mathematics and science teaching of students in grades 4 and 8. The global resource for determining the knowledge and skills of students in more than 50 countries of the world was developed based on the best international experience. TIMSS assesses student achievement in areas of knowledge such as theory, practice, and reasoning. The Knowledge block consists of mathematics that requires the student to acquire academic knowledge of numbers and properties of simple geometric figures, repeat definitions, and extract information from standard graphs and tables. In the natural sciences, it is necessary to demonstrate the level of knowledge about individual organisms and materials, the characteristics of phenomena and processes, the terms and units of natural science. When completing test tasks for application, students must demonstrate the ability to solve various life situations in mathematics and natural sciences, interpret data from tables and charts, diagrams and graphs, and conduct experimental work. Verification tasks reveal students' logical and systematic thinking skills. Tasks that require thinking may differ from each other due to the novelty of the proposed situation, the complexity of the question, the number of steps to be solved, the need to combine the knowledge of different branches of mathematics. Conducting tests in natural sciences requires students to explain some phenomena, justify conclusions, generalize and combine knowledge in different areas of natural science.

- adequate coverage of approved content and types of educational activities;
- the content of international tests is maximally compatible with the material studied in many participating countries;
- provision of communication tests;
- the importance of the tested content from the point of view of the development of mathematical and natural science education;
- a test was developed to assess students' age characteristics and their achievements;
- compliance with the requirements for public research. - Types of tasks

– by choosing an answer,
– with a short and fully distributed answer,

- practical tasks

Mathematical literacy is a person's ability to think mathematically about various life situations (contexts) and problems, to be able to express a given problem using mathematics, to be able to use mathematics to solve a problem, and to be able to use the obtained results to interpret and evaluate the

solution to the problem. It includes concepts, algorithms, facts, and tools to describe, explain, and predict events. It helps people understand the place of mathematics in the world and make the informed judgments and decisions needed by creative, curious, and self-reflective citizens of the 21st century. Each country has its own vision of the concept of mathematical literacy or competence and organizes its educational process to achieve it as an expected outcome. Historically, mathematical literacy or competence has included the acquisition of basic arithmetic skills, particularly the ability to add, subtract, multiply, and divide whole numbers, simple and decimal fractions, calculate percentages, and calculate the area and volume of simple geometric shapes. Recently, the introduction of digital technologies into our lives has led to the emergence of opportunities for people to obtain the necessary information from the flow of information to meet their personal needs, in areas of life related to health and investments, weather and climate changes, taxation, public debt, population growth, epidemics of infectious diseases. spread has also created a need for skills related to solving social problems such as the global economy. The daily changes of the life needs of the 21st century, in turn, require the expansion and improvement of the concept of mathematical literacy.

Expression of situations in mathematical language:

- reading and understanding the nature of problematic situations given in different contexts related to various aspects of human activity: personal life, future professional activity, educational activity, social life in society, science and technology;
- analysis of the given situation and identification of the problem presented in it;
- recognition of mathematical structures (laws and relationships) given in problems and situations;
- simplification of problems and situations, dividing them into separate issues;
- identifying the possibilities of practical use of the information given in the description of the situation, processing and expressing the problem in the form of a mathematical problem;
- creating a mathematical model reflecting the important aspects of the problem situation.

Applying Mathematics:

- use of learned mathematical concepts, facts, ideas, laws, algorithms and methods to solve a practical mathematical problem;
- analysis, selection and justification of alternative methods of solving the problem;
- creating and mastering new mathematical knowledge in the process of solving a problem (problem);
- expression and research of mathematical assumptions, mathematical reasoning, comparison and evaluation;
- use of logical, creative thinking, mathematical reasoning and scientific research methods in problem solving: observation, measurement, experimentation, analysis and synthesis, induction and deduction, comparison and analogies;
- recognizing and using connections between mathematical concepts;
- application of mathematics in educational and life situations encountered in everyday life and related to other subjects;
- use of various mathematical interpretation methods to explain and model phenomena and processes in nature and society.

Interpretation of the solution:

- thinking about the results obtained from the mathematical solution of the practical problem, transferring the mathematical solution to the content of the real problem and interpreting it in relation to the real problem described in the mathematical problem, and evaluating the compatibility and proximity of the found solution to the real solution of the problem;
- to use mathematical language, signs and symbols, as well as computer and information communication technologies for clear, written and visual expression of mathematical ideas.

Types of mental activities of students used in mathematical reasoning and problem solving:

- draw simple conclusions;
– choosing the appropriate justification;
- based on the content of the problem, explain whether the mathematical result or conclusion has meaning or not;
- expressing the problem in a different form, including adapting it to mathematical concepts and making relevant assumptions;
- application of definitions, rules and formulas, algorithms and calculations;
- substantiation of the constructed mathematical model suitable for the real situation;
- explanation and justification of processes and algorithms, models used to determine a mathematical result or solution;
- determination of model boundaries for problem solving;
- such as thinking about mathematical evidence in explaining and justifying a mathematical result.

Creating test items is a task that requires a thorough understanding of the content area. In addition, imagination and creativity are required, but at the same time serious discipline is required in working with assessment scopes and following the guidelines in this manual for constructing test items. In general, these guidelines for good test assignment and test design practice have been compiled from several sources. They are designed to help construct test items that fairly and reliably measure student achievement in mathematics and science, thereby increasing the validity of assessments within the TIMSS study. All of the following issues should be considered when evaluating the quality and suitability of test items for inclusion in TIMSS pilot tests. The first step in preparing to create a test for fourth or eighth grade is to focus on the content area being assessed. Also, keep in mind that each test item must address a specific cognitive domain. Together, these two areas provide evidence of what students know and can do. That is, what content knowledge does this test allow the student to demonstrate? What cognitive processes does this test require the student to demonstrate? Note that there should be easy, medium, and difficult test items that cover each of the content areas. It is more difficult to construct easy test items that assess the cognitive domain of reasoning. Although the TIMSS fourth- through eighth-grade science domains specify skills related to scientific practice, not every science test item necessarily addresses these skills. make sure there are no ambiguities or mistakes that could confuse readers.

We need to be precise when creating math and science test items. That is, each test item should begin with a direct question or clearly defined task. When designing a test item, we need to think about the main question we want to ask. We must include specific information in assignments. Too much information can confuse readers. In addition, we must take into account the time allotted for the test.

When creating test items, it is important to consider the time it will take students to complete the given task. The time required to complete one test item should correspond to the time allotted for the total test items.

For example, Davron first traveled 4.8 km by car, then 1.5 km by bus. How far did the cycle go?
A. 6, 3 km
B. 5, 8 km
C. 5, 13 km
D. 4, 95 km
Content Area: Numbers and Operations.
Cognitive domain: application.
Subject Area: Simple and Decimal Fractions.
Maximum score: 1.
Key: A.

There are two ways to choose answers to test tasks. The first is single-choice test items. These

usually have a single question or item with four answer options (ie A, B, C, D) of which one is counted as correct (known as multiple choice test items). Students are asked to click on the answer they think is correct. The example above is an example of a single-choice test.

Second, multiple-choice test items contain a single question about a concept with approximately half of the answers being true and half being false (e.g., characteristics of mammals, conductivity of materials, multiples). In this, students can click on all the answer options that they think are correct.

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