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INTERNATIONAL SYSTEMS FOR ASSESSING THE QUALITY OF EDUCATION AND THE CONTENT OF MATHEMATICS

Sayfullaeva Gulhayo Ikhtiyor kizi
Professor, Department of Physics and Astronomy,
Navoi State University
Ilkhomova Shakhnoza
Student, Navoi State University

Annotation

In today's globalized world, the quality of a country's educational system exerts a profound influence on its international competitiveness. As the foundation of digital technologies, artificial intelligence, modern economics, and engineering, mathematics has become critically important. For these reasons, there is an urgent need for modernized mathematics education that incorporates international best practices and is integrated with the national system through contemporary teaching methodologies.

The objective is to conduct an academic analysis of the results from various international assessment programs (PISA, TIMSS, TALIS, PIRLS) and to examine the impact of advanced foreign models from developed nations on the quality and intensity of education.

Keywords: globalization, digital technologies, problem-based learning, cognitive.

21st century education requires, first of all, the formation of independent thinking, logical analysis, working with numbers, problem solving and reasoning skills in students. Mathematical knowledge is now considered not only as a matter of memorizing formulas, but also as a process of analyzing real-life situations, creating models and choosing solutions.

According to modern requirements, mathematics should form the following competencies:

- mathematical literacy;
- logical-analytical thinking;
- statistical and probabilistic thinking;
- information processing and digital competencies;
- problem-based thinking.

In this sense, a competency-based approach, STEAM integration, and practical tasks have become an integral part of modern mathematics education. Mathematical literacy does not mean having deep knowledge in mathematics, but rather solving problems using mathematical methods in everyday tasks, on the streets and in the markets. That is, it is the ability to solve various everyday problems through logical thinking and reasoning, to express events and phenomena occurring in nature using mathematical symbols and signs, and to use various simple algorithms and concepts related to mathematics. Mathematical literacy is an integral part of human life. It is impossible to imagine that every competent person can find his place in society without having a certain level of understanding and skills in mathematical literacy.

Logical thinking is drawing conclusions about something, someone, or events and phenomena based on certain arguments, facts, and reasoning.

Analytical Thinking is the ability to break down a complex problem or situation into smaller, manageable parts and examine each part in depth to understand it. It is an important skill

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that is needed to effectively solve problems, make sound decisions, and clearly communicate ideas and thoughts by providing clear arguments in various discussions and debates. This skill is important not only in mathematics and other sciences, but also in business, law, programming, and almost all aspects of everyday life.

Probabilistic thinking is thinking based on probability theory, that is, quantitatively assessing the likelihood of a certain event occurring and understanding uncertainty.

Information processing is the process and skills of receiving, sorting, analyzing, storing, processing, and ultimately extracting meaning from incoming information. It emphasizes more cognitive processes. Digital competences or digital literacy are the set of knowledge, skills and attitudes necessary for the effective, safe and critical use of digital technologies and tools. It helps to carry out the process of working with information in a digital environment.

Problem-based thinking is a methodology and way of thinking widely used in education and problem-solving, aimed at developing active learning and critical thinking skills through solving real-life and complex problems. In this case, the student or employee first encounters the problem itself, and then acquires the knowledge, concepts and skills necessary to solve it. In recent years, advanced international experiences in teaching mathematics have been widely used in our country. Various new methods are being used in educational institutions as a test. Among them, we can cite the Japanese and Singapore models as examples. The Singapore model is known for its "KVA" (Concrete-Visual-Abstract) approach. According to this method, the child first sees objects in real life (concrete), then imagines them through pictures or diagrams (visual), and then expresses them with mathematical symbols and formulas (abstract). This three-stage system helps students acquire knowledge in a deep and solid manner.

In Japanese education, mathematics lessons are organized through problem situations and open-ended questions. For example, questions such as "Why does any number multiplied by 1 get the same number?" encourage children to think logically. Also, competencies such as working in groups, listening to each other's opinions, and coming to a common solution are developed.

As we are currently witnessing development and progress in all areas and directions, new methods and criteria are being introduced in the assessment systems for mathematical knowledge and skills. Examples of these include PISA, TIMSS, TALIS, and PIRLS.

The Programme for International Student Assessment (PISA) is a program that assesses the literacy (reading, mathematics, natural sciences) and practical application of knowledge of 15-year-old students in different countries. PISA tests are conducted to determine the extent to which school students have the skills needed to analyze real-life phenomena, draw conclusions from them, and communicate, and to what extent the education system is adapting to these changes. This program was introduced in 1997 and is held every three years, first held in 2000. Every three years, one subject area is given priority, and almost 50% of the total set of tests belongs to this subject. In 2000, for the first time, emphasis was placed on reading literacy. The test is organized by the Organization for Economic Cooperation and Development (OECD) in a consortium with leading international scientific organizations, with the participation of national centers. The study covers countries that are members of the Organization for Economic Cooperation and Development, as well as countries that have cooperative relations with the OECD. Uzbekistan participated in PISA for the first time in 2022.

This was a significant step for Uzbekistan in international education rankings. The results were announced on December 5, 2023, and Uzbekistan ranked near the bottom (80th) out of 81

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countries. 7,293 students (from 202 schools) participated, representing 88% of the 15-year-old population. President Shavkat Mirziyoyev described the results as "indicating the need for educational reforms" and set a goal of entering the top 30 by 2030.

TIMSS (Trends in International Mathematics and Science Study) is a program to assess the level of mathematics and science achievement of 4th and 8th grade students, conducted every four years. In addition to comparing the level and quality of knowledge acquired by 4th and 8th grade students in mathematics and science and identifying differences in national education systems, the TIMSS international assessment program also examines the content of mathematics and science education in schools, the learning process, the capabilities of the educational institution, the potential of teachers, and factors related to the families of students. The TIMSS program began its first study in 1995 and has been conducted every four years until 2019, in 1999, 2003, 2007, 2011, 2015, and 2019.

TIMSS 2015: Only Grade 4 Uzbekistan results: mathematics — 474 points, natural sciences — 478 points World average: 500 points Position: 43–45th place (among 50 participating countries)

TIMSS 2019: Grades 4 and 8 Grade 4: Mathematics — 490 points, Science — 481 points Grade 8: Mathematics — 437 points, Science — 448 points World average: 500 points Position: – Grade 4: 35–38th place – Grade 8: 43–45th place (among 59 participating countries)

TIMSS 2023: (results announced on December 10, 2024) Grades 4 and 8 Grade 4: Mathematics — 485 points, Science — 475 points Grade 8: Mathematics — 450 points, Science — 460 points World average: 500 points Estimated position: – Grade 4: ~40th place – Grade 8: ~45th (out of 65+ participating countries)

TALIS stands for Teaching and Learning International Survey. This survey is the largest international teacher survey conducted every 5 years by the OECD (Organization for Economic Cooperation and Development). Uzbekistan performed averagely, but opportunities for improvement were identified in reading literacy.

Overall: Singapore scores highest (587 points), Poland and Northern Iraq are also among the leaders. Average score: 500. 70% of students have mastered the basic level.

Uzbekistan: Around 500 points (world average). Boys perform lower than girls. Home libraries and parental involvement are highly rated, but school resources and digital tools are low.

Challenges: Students' ability to analyze and critically evaluate text is low (30-40% globally).

To improve the quality of mathematics education, it is necessary to introduce various modern technologies, study and nationalize international experiences, optimize the content of the subject, and strengthen new modern approaches. PISA, TIMSS, TALIS, and PIRLS studies provide important information about the quality of education and allow us to identify strengths and weaknesses in the teaching process. Advanced foreign experiences are of practical importance for the Uzbek education system, and their application in accordance with national conditions will significantly improve students' competencies in mathematics. It is necessary to effectively use such experience not only to develop mathematics education, but also to develop the teaching of other subjects.

These studies are complementary:

PIRLS assesses the basis of literacy, TIMSS assesses knowledge in subjects,

PISA assesses life skills, and TALIS assesses pedagogical conditions of the educational process. Based on their results, it is possible to improve educational policy, update curricula, and improve teacher training.

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In conclusion, the international studies PISA, TIMSS, PIRLS, and TALIS allow for a comprehensive assessment of the quality of education. Based on the results of these studies, the strengths and weaknesses of the education system are identified and development strategies are developed based on modern requirements. Studying these studies at the master's level is of great importance in developing the scientific and analytical competencies of future specialists.

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