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The Importance of the Integration of the International Assessment System in Mathematics Education

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Abstract

In recent years, our country has made significant progress in economic development due to the reforms implemented, which have led to impressive economic growth indicators across all sectors. As a result, there is a growing demand for skilled personnel and qualified specialists in all fields, reflecting the need to enhance the interest of our students in their studies and increase the attention of teachers to all aspects of education.

Key words: country, reforms,

In recent years, our country has made significant progress in economic development due to the reforms implemented, which have led to impressive economic growth indicators across all sectors. As a result, there is a growing demand for skilled personnel and qualified specialists in all fields, reflecting the need to enhance the interest of our students in their studies and increase the attention of teachers to all aspects of education.

The importance of these requirements for the education system is extremely crucial, as evidenced by the evaluation and monitoring of the development of education and science sectors, similar to the advancements in education and science fields in many foreign countries. It suggests the need to attract innovative experiences aimed at enhancing the quality of education through the evaluation and active introduction of these practices into the system.

The Decree No. 997 of the Cabinet of Ministers of the Republic of Uzbekistan dated December 8, 2018, on "Measures to organize international research on the evaluation of the quality of education in the public education system," outlined the most important tasks as follows:

- Introducing changes and additions to state educational standards, teaching programs, and educational materials in the fields of learning, mathematics, and natural sciences;
- Creating a national database of questions in line with the evaluation program of PISA and TIMSS and integrating them into the teaching programs;

- Conducting systematic reviews of exams held from 2019 to 2021 in a structured manner to assess the practical results.

According to the Decree No. 997 of the Cabinet of Ministers, it is stipulated that international research on the evaluation of public evaluation programs should be conducted as per the following guidelines:

- Evaluating the level of mastering mathematics and natural science subjects by 4th and 8th grade students based on Trends in International Mathematics and Science Study (TIMSS);
- Evaluating the proficiency level of 15-year-old students in learning, mathematics, and natural sciences based on the Programme for International Student Assessment (PISA).

Numerous studies have been conducted globally to integrate modern technologies in education to enhance students' proficiency in mathematics and develop the curriculum with integrated outcomes achieved in science. International evaluation programs (EGMA, PISA, TIMSS, PIRLS) effectively utilize textual issues, especially logical and combinatorial problems, to assess students' proficiency in mathematics. Consequently, elucidating the importance and place of logical and combinatorial problems in mathematics lessons for students, developing pedagogical approaches to enhance logical thinking in students, and enhancing teaching technologies to align with these goals have become significant tasks for educators nowadays.

Participation in international evaluation programs is directly related to enhancing the quality of education. Participation in these programs evaluates not only the retention of students' learning outcomes in Uzbekistan but also serves as a crucial means for improving students' competencies, which allow them to apply the knowledge gained in school in real-life situations, develop creative and logical thinking skills, and cultivate and enhance these competencies for assessment in meaningful environments.

Analyzing the questions in the PISA and TIMSS international evaluation programs, we can draw a practical line discerning theoretical knowledge, enabling students to apply the knowledge acquired in school to their daily activities, continue learning and studying, enhance their mathematical knowledge, skills, and competencies, and shape a successful individual who can think clearly, critically, and logically in a society undergoing rapid development and advancement.

The second generation of students created based on the State educational standard have been allocated 7 hours in the 2nd grade, 16 hours in the 3rd grade, and 12 hours in the 4th grade for the section "Simple combinatorics and logical problems" in the Mathematics curriculum. The initial grades have been allocated a total of 35 hours for this section in the "Mathematics" course content. In international assessment programs, innovative approaches based on logical, combinatorial, and non-standard problems have been given attention in teaching introductory grade mathematics classes so that students achieve higher performance levels.

Sample tests from TIMMS 2015 include the following question:

Problem 1: Given the numbers 8, 4, 9, 1, 5, 3, how many three-digit numbers can be formed where each digit can be used only once?

Combinatorial problems aim to determine the number of possible combinations satisfying given conditions, identify all possible combinations, and determine the most reasonable options based on the given conditions.

To solve this problem, it is necessary to use the following grouping formula. The number of non-repeating groups of m elements out of k elements show the difference when a group is made from the remaining k elements after selecting m elements (where k elements are chosen from m elements) is found through C_k^m a formula.

$C_k^m = \frac{A_k^m}{m!}$

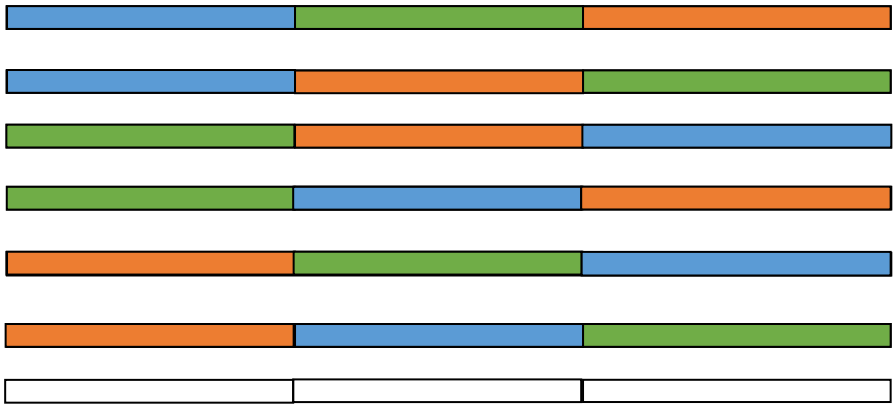
Therefore, when calculating the above problem using $C_6^3 = \frac{A_6^3}{3!}$ this formula, we arrive at the correct answer, $C_6^3 = \frac{A_6^3}{3!} = \frac{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1} = 120$ which is 120.

Before teaching how to solve such problems, it is necessary to first demonstrate and solve simpler problems. Students don't necessarily have to use combinatorial problems directly to solve such problems in the initial grades. Selection methods are presented to identify all possible combinations that can occur when solving these types of problems, rather than requiring an understanding of formulas and definitions. Therefore, the process of arranging various combinations directly related to teaching introductory grade mathematics and determining not the number of solution outcomes but how these possibilities can be achieved is emphasized. To achieve this, students need to correctly and quickly identify all possibilities that can be divided based on directly arranged combinations and show that other possibilities are not present.

For example, consider the following problem:

Problem 1: Three different colored paper clips are provided.

Arrange these clips and create one three different colored paper clip. Identify the number of possible types of clips in the drawing.



Students' understanding and skills in solving combinatorial problems have been developed in a methodical and systematic way, allowing them to identify all possibilities. By observing the process of solving the above problem, it is possible to implement this.

In conclusion, increasing students' proficiency in mathematics, integrating educational content with the results achieved in science, and introducing modern technologies in education in a way that is integrated with the skills and professionalism of the teacher are essential.

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