THE IMPORTANCE OF INTERNATIONAL ASSESSMENT PROGRAMS IN DEVELOPING MATHEMATICAL LITERACY OF PRIMARY SCHOOL STUDENTS

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Abstract: This article analyzes the issue of developing mathematical literacy among primary school students based on the requirements of international assessment programs, particularly PISA and TIMSS. The content and essence of the concept of mathematical literacy are explained, and the pedagogical significance of its formation in the process of primary education is revealed.

In addition, based on practical experience conducted in a 2nd-grade mathematics lesson, the impact of traditional tasks as well as life-based and explanatory tasks on students' thinking was studied. The results of the research showed that tasks close to the format of international assessment programs contribute to the development of students' logical thinking, analytical skills, problem-solving abilities, and the application of mathematical knowledge in practice.

Keywords: mathematical literacy, primary education, PISA, TIMSS, international assessment programs, methodological approach, practical tasks, logical thinking.

Introduction

In the conditions of globalization and rapid development, new and important tasks are being set before the education system. Modern society requires individuals who not only possess knowledge but are also able to apply their knowledge in various real-life situations, think independently, and solve problems. From this perspective, developing functional literacy among students, especially mathematical literacy, is considered one of the priority directions of today's education system.

The stage of primary education serves as a fundamental basis for developing students' logical thinking, forming calculation skills, and understanding mathematical concepts. It is during this period that students' attitudes toward mathematical knowledge, their culture of thinking, and their ability to make decisions in problematic situations begin to develop. Therefore, organizing mathematics education effectively in primary grades and developing mathematical literacy is considered an актуal pedagogical issue.

In recent years, international studies have gained particular importance in assessing the quality of education. In particular, studies such as PISA and TIMSS make it possible to determine not only the level of students' knowledge but also their ability to apply

knowledge in practice, analyze information, and think independently. Therefore, introducing methodological approaches in primary school mathematics lessons that correspond to the requirements of these programs is of great importance.

The purpose of this article is to analyze the role of international assessment programs in developing mathematical literacy among primary school students and to develop effective methodological recommendations based on practical experience.

The Content of the Concept of Mathematical Literacy

Mathematics is one of the sciences that plays an important role in the development of humanity. It is considered not only a means of calculation but also an important tool that develops logical thinking and helps find solutions to problematic situations. For this reason, modern education systems pay special attention not only to mathematical knowledge but also to the formation of mathematical literacy.

The concept of mathematical literacy implies not only the acquisition of mathematical knowledge by a student but also the ability to apply this knowledge in various real-life situations. This concept is not limited to performing arithmetic operations or memorizing formulas. It also includes the ability of students to understand a problem, analyze available information, construct a mathematical model, interpret the result, and justify their conclusions.

According to modern pedagogical approaches, mathematical literacy consists of the following main components:

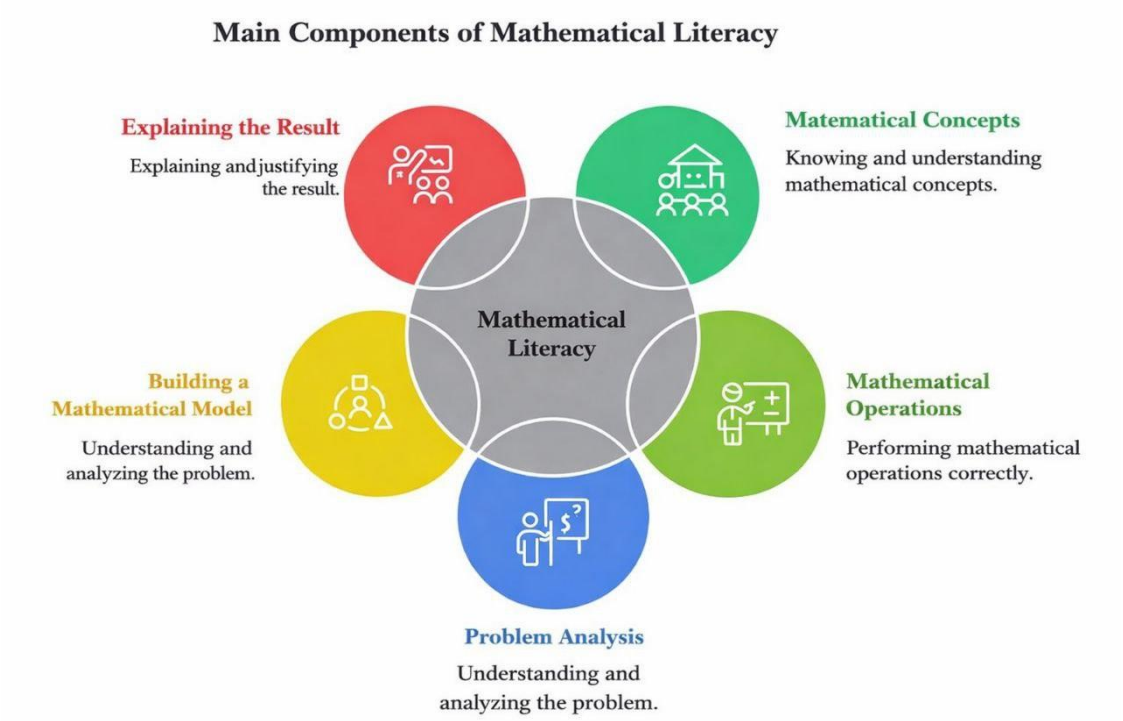
knowledge of mathematical concepts;

correct performance of mathematical operations;

understanding and analyzing a problem;

constructing a mathematical model;

interpreting and justifying the result



These components contribute to the formation of students' mathematical thinking. A student with developed mathematical literacy not only solves a problem but also understands its content, explains the solution process, and justifies the correctness of the obtained result.

The formation of mathematical literacy is especially important at the stage of primary education. This is because during this period students develop calculation skills, logical thinking, and the ability to understand and analyze problem situations. If mathematical concepts are formed correctly and systematically at this stage, the learning of mathematics in subsequent stages of education becomes much more effective.

The Role of International Assessment Programs in Developing Mathematical Literacy

Today, international assessment programs serve as an important source for evaluating and improving the quality of education. By assessing students' knowledge and skills based on international standards, different countries gain the opportunity to identify the strengths and weaknesses of their education systems.

Among such international programs are PISA and TIMSS. The PISA program mainly determines the level at which 15-year-old students are able to apply their knowledge in reading, mathematics, and science in real-life situations. The main feature of PISA is that it focuses more on students' practical thinking, analytical ability, and decision-making skills rather than only on theoretical knowledge.

PISA tasks are usually based on real-life situations. In such tasks, students are required to understand the problem, analyze the given information, construct a mathematical model, and draw conclusions. In this respect, PISA is considered one of the most effective approaches for assessing mathematical literacy.

The TIMSS study, on the other hand, mainly evaluates the level of knowledge acquired by 4th- and 8th-grade students in mathematics and science. TIMSS tasks are generally divided into three cognitive levels:

knowing;

applying;

reasoning.

At the knowing level, students' understanding of concepts and their ability to perform simple calculations are assessed. At the applying level, their ability to use knowledge in various situations is evaluated. At the reasoning level, skills such as analysis, justification, and drawing conclusions are examined.

The experience of these international programs shows that mathematics lessons in primary grades should not be limited to memorizing rules or solving simple exercises. Instead, students should be given life-based, thought-provoking, and explanatory tasks. Such an approach contributes to the development of their mathematical thinking and functional literacy.

Methods for Developing Mathematical Literacy in Primary Grades

To develop mathematical literacy in primary grades, it is necessary to effectively use various pedagogical methods and tools in the teaching process. These methods help

develop students' independent thinking, enable them to analyze problem situations, and allow them to apply mathematical knowledge in real-life contexts.

One of the effective methods is the problem-based learning method. In this method, ready-made knowledge is not directly given to students; instead, they are faced with problem situations and encouraged to search for solutions based on their own ideas. This process develops logical thinking and independent decision-making skills.

The use of life-based problems is also of great importance. Tasks related to everyday life help students understand the real-life significance of mathematics. For example, problems related to shopping in a store, calculating time, determining distance, or counting fruits and school supplies serve as effective tools for developing mathematical literacy.

In addition, the use of interactive methods is important. Methods such as "Brainstorming," "Question and Answer," "Working in Small Groups," and "Cluster" increase students' activity during the lesson and develop their skills of exchanging ideas and solving problems collaboratively.

Didactic games are also one of the effective tools in primary education. Tasks presented in the form of games engage students in the lesson, help them focus their attention, and create opportunities for easier assimilation of mathematical knowledge.

In addition, the use of modern information and communication technologies plays an important role in developing mathematical literacy. With the help of visual materials, charts, interactive exercises, and electronic resources, mathematical concepts are conveyed to students in a more understandable and engaging way**.**

Practical Experiment and Its Analysis

In March 2026, a practical experiment was conducted during a 2nd-grade mathematics lesson. The main purpose of the study was to determine the level at which the existing tasks in the textbook contribute to the development of mathematical literacy and to explore the possibility of adapting them to the requirements of international assessment programs.

During the lesson, students were first given traditional tasks. For example, simple arithmetic exercises such as "Calculate 36 + 24" demonstrated their computational skills but did not allow them to explain the content of the problem or interpret the result in a practical context.

Subsequently, the same problem was adapted to a real-life situation: "A bookstore received 36 books, and then 24 more books were added. How many books are there in total in the store?" Tasks of this type increased students' engagement. They not only attempted to find the answer but also tried to explain the problem, visualize the situation, and interpret the result.

During the experiment, the tasks were organized into three levels:

Simple arithmetic operations;

Tasks applied to real-life situations;

More complex problems requiring reasoning and explanation.

The results showed that students completed the first-level tasks relatively quickly and easily. Second-level tasks activated their ability to understand and analyze problem situations. Third-level tasks encouraged independent thinking, explaining solutions, and justifying results.

The experiment also revealed that many tasks in the textbooks only require writing the answer and do not provide sufficient opportunities to develop students' deeper thinking. Therefore, it is necessary to include more life-based and explanatory tasks in textbooks.

The Importance of PISA-Style Practical Tasks

During the experiment, tasks close to the PISA format, based on real-life situations, were used. Examples included:

Tasks related to a bookstore;

Fruit trading;

Counting classroom chairs;

Calculating time;

Number of passengers in transport;

Problems related to money and expenses.

The advantage of such tasks is that they require students not only to perform calculations but also to understand the situation, connect information, construct a step-by-step solution, and explain the results. Therefore, these types of problems are considered more effective for developing mathematical literacy than traditional tasks.

In the practical experiment, it was observed that these types of tasks increased students' interest in the lesson, enhanced group work activities, and developed their ability to link mathematical concepts to practical applications.

Conclusion

The results of the study showed that developing mathematical literacy in primary school students is an important factor in improving the effectiveness of education. Mathematical literacy helps students develop not only computational skills but also logical thinking, problem analysis, interpretation of results, and the ability to apply mathematical knowledge in practice.

The experience of international assessment programs such as PISA and TIMSS indicates that modern mathematics education should not be limited to teaching formulas and rules. On the contrary, tasks based on real-life contexts that require analysis, explanation, and reasoning should become an integral part of the lesson process.

The practical experiment conducted in the 2nd grade confirmed that traditional tasks develop students' computational skills but are insufficient for fully developing mathematical literacy. Life-based tasks, which gradually increase in complexity and require explanation, significantly enhance students' thinking, logical reasoning, and independent decision-making skills.

Based on this, it is appropriate to more widely introduce practical, real-life tasks aligned with international assessment formats into 2nd-grade mathematics textbooks and lesson processes.

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