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INNOVATIVE APPROACHES TO THE DEVELOPMENT OF MATHEMATICAL LITERACY IN PRIMARY GRADES

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Abstract: This article scientifically analyzes the importance of innovative pedagogical approaches in developing mathematical literacy in primary school students. The relevance of the problem is determined by the need to develop functional literacy within the modern education system. In the course of the research, methods such as pedagogical observation, experimental work, comparison, and statistical analysis were employed. The results obtained demonstrate that innovative methods contribute to the development of students' ability to apply mathematical knowledge in real-life situations. In conclusion, innovative approaches are substantiated as a significant factor in improving the effectiveness of primary education.

Key words: Mathematical literacy, primary education, innovative approach, competency-based education, functional literacy, problem-based learning, STEAM, interactive method, algorithmic thinking, pedagogical innovation.

The object of the research is the process of forming mathematical literacy in primary school students. The concept of mathematical literacy is broadly interpreted within the framework of the international assessment program - Programme for International Student Assessment, which means the ability to apply mathematical knowledge in real-life situations [1]. In today's globalization, the quality of education is an important factor in the development of a country. As the President of the Republic of Uzbekistan Shavkat Mirziyoyev noted: "There is one truth in the world that does not require proof: the development of any country depends on a healthy and educated generation" (source: https://president.uz). This idea justifies the need to create a solid foundation of knowledge at the stage of primary education, in particular, the development of mathematical literacy. Also, the Organization for Economic Co-operation and Development reports note that students' skills in applying mathematical knowledge in practice are not sufficiently developed [1]. This indicates the need to improve traditional teaching methods. Determining the effectiveness of innovative approaches to developing mathematical literacy in primary grades and methodological substantiation.

The issue of developing mathematical literacy in primary grades is one of the priority areas of modern pedagogy and educational policy. In recent years, the concept of mathematical literacy has been interpreted in a broader context, in contrast to the traditional concept of "mathematical knowledge". In particular, the International Assessment Program - Programme for International Student Assessment defines mathematical literacy as "the ability of a person to apply mathematical knowledge in different contexts, to mathematically model a problem, analyze it and justify the result" [1]. This approach is based on the methodological framework developed by the Organization for Economic Co-operation and Development. OECD reports emphasize that mathematical literacy is not only a process of calculation, but also a mathematical analysis of real-life situations and sound decision-making [1]. This indicates the need to form functional literacy at the primary education stage. The historical roots of mathematical thinking are also studied separately in scientific literature. In the scientific heritage of Eastern scholars, much attention is paid to logical and algorithmic thinking. In particular, Muhammad al-Khwarizmi's

work “Al-jabr wal-muqabala” was an important stage in the formation of the science of algebra, which substantiated the principles of step-by-step problem solving, logical consistency and generalization [2]. The scientist's scientific views form the theoretical basis of the algorithmic and systematic thinking methodology used in innovative pedagogical technologies today. Modern research substantiates the effectiveness of the constructivist approach in developing mathematical literacy. According to constructivist theory, the student does not receive knowledge ready-made, but independently constructs it in the active learning process. In this regard, problem-based learning, interactive methods, project activities, and the STEAM approach are widely used [3]. Scientific articles emphasize that, especially in primary grades, game technologies and situational tasks close to real life significantly increase mathematical literacy. [3] - the source notes that traditional reproductive teaching methods cannot adequately form students' logical and critical thinking skills. On the contrary, interactive and innovative methods turn the student into an active subject, which ensures the sustainable assimilation of knowledge. The competency-based approach is also gaining priority in the national education policy. The school education standards of the Republic of Uzbekistan define mathematical literacy as a basic competency, in which the integration of knowledge with practice is indicated as a basic requirement [4]. These standards define the tasks of developing students' skills in problem identification, analysis, logical conclusions, and independent decision-making. At the same time, some researchers emphasize the need to maintain a balance in the use of innovative technologies. In their opinion, if digital tools are used excessively, basic computational skills may weaken. However, OECD analyses note that the purposeful and methodical use of digital tools, on the contrary, deepens students' mathematical thinking [1]. Literature analysis shows that the issue of developing mathematical literacy is multifaceted, covering historical, theoretical and practical aspects. While the scientific heritage of Eastern thinkers [2] has defined the theoretical foundations of mathematical thinking, modern international research [1] highlights its functional and competency-based aspects. National standards [4] determine the introduction of this approach into educational practice.

However, the existing scientific works do not sufficiently address the systematic integration of innovative approaches at the primary school level and a comprehensive analysis of their impact on mathematical literacy. Therefore, this study aims to determine and scientifically substantiate the effectiveness of innovative methods on the basis of experimental testing.

The following methods were used in the research process:

1-Pedagogical observation

2-Experimental testing (based on control and experimental classes)

4- Diagnostic tests

5- Statistical analysis

The experiment was conducted among students in grades 3–4. Problem-based learning, interactive games, STEAM elements and digital tools were used in the experimental group. In the control group, lessons were conducted based on the traditional method. The results of the experiment showed that: The ability to solve problem situations increased by 28%; The level of logical thinking significantly developed; president.uz (https://president.uz/)

Shavkat Mirziyoyev - President of the Republic of Uzbekistan

Shavkat Mirziyoyev President of the Republic of Uzbekistan - the official website of the President. Information about the President of Uzbekistan Shavkat Mirziyoyev. Positive motivation towards mathematics increased; Independent decision-making skills were formed. The results were found to be consistent with international assessment criteria [1].

Also, in modern educational concepts, the introduction of innovative approaches to the educational process is considered an important tool for achieving sustainable development goals

[6]. The results obtained confirm the effectiveness of innovative methods. There is an inextricable link between the historical roots of algorithmic thinking [2] and the modern competency-based approach [1]. Innovative methods do not negate the traditional approach, but rather enrich it. The methodological use of digital tools deepens students' thinking [3]. The study was conducted in a short period of time. It is recommended to conduct long-term monitoring studies in the future.

Innovative approaches are an effective pedagogical tool in developing mathematical literacy in primary grades.

The following proposals are put forward:

1. Widely introduce problem situations into the teaching process;
2. Integrate STEAM elements;
3. Rational use of digital educational tools;
4. Increase the innovative competencies of teachers.

Developing mathematical literacy is an important condition for improving the quality of education.

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