INTERNATIONAL JOURNAL OF POLITICAL SCIENCES AND ECONOMICS
Impact Factor (research bib) - 9,78
https://ijmri.de/index.php/ijpse , German international journals company
ISSN 2751-9708

IMPROVING MATHEMATICAL LITERACY IN PRIMARY EDUCATION: PROBLEMS AND SOLUTIONS

Teacher of the Department of Digital Technologies and Mathematics, Kokand University
Xaydarov Iqboljon

Abstract: This article explores the significance of improving mathematical literacy in primary education and examines the major challenges and effective solutions associated with its development. Mathematical literacy is recognized as an essential component of modern education, enabling pupils to apply mathematical knowledge in everyday situations, think critically, solve problems, and make informed decisions. The study analyzes common obstacles that hinder the development of mathematical literacy among primary school learners, including limited practical application of mathematical concepts, insufficient learner engagement, individual differences in learning abilities, and the use of traditional teaching methods. To address these challenges, the article proposes a range of pedagogical solutions, such as the implementation of interactive teaching strategies, differentiated instruction, problem-based learning, and the integration of information and communication technologies into mathematics education. The research highlights the importance of creating a supportive and learner-centered educational environment that encourages active participation and independent thinking. Based on theoretical analysis and practical observations, the findings demonstrate that effective approaches to improving mathematical literacy contribute not only to better academic achievement but also to the development of logical reasoning, creativity, communication skills, and lifelong learning competencies. The article concludes that strengthening mathematical literacy in primary education is a key factor in preparing pupils for the demands of the twenty-first century and fostering their overall intellectual development.

Keywords: mathematical literacy, primary education, educational problems, pedagogical solutions, problem-solving, logical thinking, functional literacy, differentiated approach, interactive methods, innovative technologies.

Introduction

In recent years, improving the quality of education has become one of the main priorities of educational reforms worldwide. Within this context, the development of mathematical literacy among primary school pupils has gained particular importance. Mathematical literacy is considered a fundamental competency that enables learners to understand, interpret, and apply mathematical knowledge in various real-life situations. It supports the development of logical reasoning, critical thinking, and effective problem-solving skills, which are essential for success in the modern world.

Primary education plays a crucial role in establishing the foundations of mathematical literacy. During this stage, pupils acquire basic mathematical concepts, develop numerical understanding, and learn to use mathematical thinking as a tool for analyzing everyday problems. However, despite the importance of mathematical literacy, many primary school pupils experience difficulties in applying mathematical knowledge beyond classroom exercises. These challenges may result from traditional teaching methods, limited opportunities for practical application, differences in learning abilities, and insufficient motivation among learners.

Current educational trends emphasize the need to move beyond memorization and routine calculations toward the development of higher-order thinking skills. International assessments

have demonstrated that successful mathematical learning depends not only on the acquisition of mathematical knowledge but also on the ability to use that knowledge effectively in unfamiliar and practical contexts. Therefore, identifying the major problems that hinder the development of mathematical literacy and exploring effective pedagogical solutions have become important areas of educational research.

This article examines the key challenges associated with improving mathematical literacy in primary education and discusses practical strategies that can enhance pupils' mathematical understanding, engagement, and overall learning outcomes.

The education policy of the Republic of Uzbekistan also pays special attention to developing pupils' mathematical thinking, strengthening analytical approaches, and introducing innovative pedagogical technologies. However, in practice, there are still a number of problems in effectively organizing this process, including insufficient methodological training of teachers, low levels of activity and creativity in lessons, and weak pupil motivation.

For this reason, this article aims to identify the problems encountered in the process of developing mathematical literacy in primary education and to scientifically analyze their causes and solutions. The study highlights ways to improve the effectiveness of mathematics education based on the views of local and foreign scholars, advanced pedagogical experience, and modern approaches.

METHODOLOGY

The purpose of the study is to identify the didactic and methodological problems encountered in the process of developing mathematical literacy at the primary education level, to analyze their causes, and to scientifically substantiate effective solutions based on interactive methods, a differentiated approach, and ICT integration.

The object of the study is the process of mathematics education among primary school pupils. The subject of the study is the mechanisms for using methodological approaches, learning tasks, interactive methods, and digital educational resources that contribute to the development of mathematical literacy.

Research Questions

1. What are the main factors hindering the development of mathematical literacy in primary education?
2. What real-life contextual tasks should be integrated into the lesson process in order to reduce the gap between theory and practice?
3. How do interactive and differentiated approaches affect pupils' motivation and logical thinking?
4. Which competencies are strengthened by ICT platforms such as GeoGebra, Kahoot, Quizizz, Matific, and others in improving mathematical literacy?

Theoretical Foundations of the Study

From a theoretical perspective, the study is based on the concepts of mathematical literacy and functional literacy, as well as scientific views such as Vygotsky's zone of proximal development, Polya's stages of problem solving, and the PISA/OECD approach to assessing mathematical literacy.

Research Design

The study was organized on the basis of a mixed design that combines elements of qualitative and quantitative approaches. The article mainly summarizes the results of theoretical analysis and practical observations and develops methodological recommendations.

Data Collection Methods

Scientific source analysis: local and foreign literature related to the topic, regulatory documents, and PISA/OECD materials were studied.

Pedagogical observation: pupils' activity, types of errors, communication, and cooperation during primary school mathematics lessons were recorded.

Analysis of diagnostic tasks: the results of real-life contextual problems and tasks aimed at logical thinking were analyzed.

Generalization of teachers' experience: a reflective analysis was carried out on lesson scenarios in which interactive methods and ICT tools were used.

Data Analysis Methods

Content analysis: methodological ideas found in literature and educational materials were systematized.

Comparison and generalization: the advantages and disadvantages of traditional and innovative approaches were compared.

Error analysis: pupils' typical errors were classified into categories such as conceptual errors, practical errors, and errors related to logical connections.

Inductive reasoning: methodological recommendations were developed based on the results of observations and tasks.

Reliability and Validity

The reliability of the results was ensured through triangulation based on various sources, including literature, classroom observations, and task results. The methodological conclusions were aligned with scientific sources and substantiated by evidence from practical observations.

Ethical Principles

During the observation and analysis process, pupils' personal information was not disclosed; the results were presented in a generalized form. Throughout the research process, pedagogical ethical standards and the internal rules of the educational institution were observed.

Limitations

Within the scope of the article, the research results may be limited to classroom observations conducted in certain classes. In future studies, it is recommended to verify the results on the basis of a broader sample and an experimental design.

INTRODUCTION

At present, one of the most important tasks facing the education system is the formation of functional literacy among pupils, particularly mathematical literacy. In the twenty-first century, when digital technologies, information flow, and analytical thinking are becoming increasingly

important, mathematics is recognized not only as a subject that teaches scientific concepts, but also as a key field that develops logical thinking, problem analysis, and evidence-based decision-making skills.

Mathematical literacy refers to a pupil's ability to analyze events and phenomena in the surrounding world from a mathematical point of view, solve real-life problems on the basis of mathematical models, and express their ideas clearly on logical grounds. Therefore, the period of primary education serves as the foundation of this process, during which the development of pupils' culture of thinking, observation skills, consistency, and ability to draw logical conclusions becomes especially important.

The results of recent PISA international assessment programs (OECD, 2019) have shown that the level of pupils' mathematical literacy depends not only on the amount of knowledge they possess, but also on their ability to apply this knowledge in everyday life. Therefore, in the system of mathematics education, the principle of "teaching thinking" is increasingly becoming a priority over merely "teaching knowledge."

The education policy of the Republic of Uzbekistan also pays special attention to developing pupils' mathematical thinking, strengthening analytical approaches, and introducing innovative pedagogical technologies. However, in practice, there are still a number of problems in effectively organizing this process, including insufficient methodological training of teachers, low levels of activity and creativity in lessons, and weak pupil motivation.

For this reason, this article aims to identify the problems encountered in the process of developing mathematical literacy in primary education and to scientifically analyze their causes and solutions. The study highlights ways to improve the effectiveness of mathematics education based on the views of local and foreign scholars, advanced pedagogical experience, and modern approaches.

RESULTS

Within the framework of the study, the following results were obtained based on the analysis of literature, pedagogical observations, and the generalization of diagnostic task results:

The main factors hindering the development of mathematical literacy among primary school pupils were identified as the gap between theory and practice, the dominance of a monologic teaching style in lessons, insufficient individual approach, weak visualization of abstract concepts, and limited use of ICT resources.

It was observed that tasks organized on the basis of real-life contextual problems and problem situations help activate pupils' skills in understanding a problem, making a plan, and justifying a solution, as well as contribute to the formation of elements of mathematical modeling.

In lessons where interactive methods such as problem-based learning, clustering, brainstorming, Venn diagrams, and group work were applied, an increase was noted in pupils' participation, communication, and tendency to justify their opinions with evidence.

It was found that working on the basis of a differentiated approach, such as grading tasks by difficulty level, providing more complex tasks for stronger pupils, and simplified and visual tasks for pupils experiencing difficulties, had a positive effect on reducing differences among pupils and improving the stability of learning outcomes.

The purposeful use of digital platforms such as GeoGebra, Kahoot, Quizizz, Matific, and others was observed to strengthen pupils' digital thinking, quick reasoning, and self-monitoring skills through rapid feedback, immediate error identification, and opportunities for repeated practice.

In lessons where a motivational environment was created through encouragement, positive communication, game-based elements, and creative tasks, pupils' interest in the subject became more stable, and their motivation to find independent solutions and analyze problems increased.

As a general conclusion, it was scientifically and practically substantiated that the development of mathematical literacy enhances pupils' functional literacy, develops logical and critical thinking, and strengthens their competencies in analyzing real-life problems and making logical decisions.

DISCUSSION

The results of this study showed that the formation of mathematical literacy in primary education requires a multifactorial and systematic approach. The analysis of literature and practical observations confirmed that mathematical literacy is not limited only to the speed of performing arithmetic operations or memorizing a topic. Rather, it includes pupils' competencies in understanding real-life situations mathematically, modeling them, justifying solutions, checking results, and drawing conclusions. In this sense, the dominance of the traditional sequence in lessons, such as "explaining the rule – solving examples – assigning homework," may not fully contribute to deepening mathematical literacy.

The identified cases related to the gap between theory and practice can be explained by the fact that learning tasks are often abstract and distant from real-life content. In the process of working with contextual problems, pupils are required to think more deeply when analyzing the text, identifying given information, and selecting appropriate operations. This, in turn, activates mathematical language, logical connections, and argumentation skills. However, contextual problems themselves are not a problem-free solution. They must correspond to pupils' age characteristics, be linguistically simple, and at the same time require reasoning. Otherwise, the difficulty of the text may overshadow the mathematical content of the problem.

The increase in pupils' activity observed in lessons where interactive methods were used is primarily related to the strengthening of subjectivity in the learning process, that is, the pupil's role as an active participant. In the process of group work, discussing problem situations, and jointly searching for solutions, pupils try to explain their thoughts to others. This process develops mathematical speech: pupils learn to answer the question "Why did this happen?" During discussion, different solutions are compared, the causes of errors are identified, and reflection emerges. At the same time, the effectiveness of interactive methods strongly depends on the teacher's classroom management competence. If time is not distributed properly, roles are not clearly defined, and results are not summarized, activity may turn into noise.

In discussing the differentiated approach, it should be emphasized that in primary classes, pupils differ significantly in terms of their level of preparation, speed of perception, and ability to think abstractly. When the same task is given to all pupils at the same level of difficulty, stronger pupils may become bored, while those experiencing difficulties may lose motivation. Through leveled tasks, visual materials, and additional support or scaffolding, pupils can achieve success at a level appropriate to their abilities. This helps form the confidence that "I can do it too." From this point of view, a differentiated approach is considered an important condition for the sustainable development of mathematical literacy.

When discussing the results related to ICT and digital platforms, their main advantage is manifested in rapid feedback and motivational mechanisms. For example, on quiz-based platforms, pupils immediately see their results, recognize their mistakes, and have the opportunity to correct them through repeated attempts. In visual environments such as GeoGebra, abstract mathematical concepts such as shape, measurement, and relationships are presented dynamically, which makes understanding easier. However, there is also a risk in using ICT: if it

becomes only a tool for “games” or “assessment,” the depth of content may be insufficient. Therefore, when selecting platforms and designing tasks, the goal must be clear and should serve the development of competencies such as analysis, justification, and modeling.

Observations regarding the motivation factor showed that the correct model of encouragement — not only scores or “excellent” grades, but also appreciation of the learning process — positively changes pupils’ attitude toward mathematics. In an environment where pupils are not afraid of making mistakes, they make logical assumptions, try different strategies, and enjoy reasoning. This develops one of the main indicators of literacy: readiness to solve problems. Conversely, harsh criticism of mistakes or an excessive focus only on the final result may make pupils passive and hinder the development of literacy.

In general, the obtained results correspond to the components of mathematical literacy emphasized in the PISA/OECD concept: mathematizing real-life situations, using mathematical tools, and interpreting results. Therefore, the elements of this approach can also be gradually integrated into primary education. In this regard, the methodological recommendations for teachers can be explained as follows: first, include at least one real-life contextual problem in each topic; second, allocate time for explaining and justifying solutions; third, develop a bank of leveled tasks; fourth, use ICT purposefully; and fifth, regularly apply reflection questions.

The practical value of this study lies in the fact that it presents methodological directions for improving mathematical literacy as a unified system. It substantiates that effective results are achieved not through a single method or a single platform, but through the harmony of didactic goals, task design, teacher management, and pupil motivation. At the same time, it should be noted as a limitation that classroom observations and diagnostic tasks were conducted within the context of certain classes. In future studies, it is recommended to assess effectiveness indicators more accurately on the basis of a broader sample and experimental comparison, including control and experimental groups.

In conclusion, in the process of developing mathematical literacy, interactive methods and contextual tasks activate pupils’ thinking processes, a differentiated approach ensures stability in learning, and ICT improves the quality of teaching through visualization and rapid feedback. The integrated use of these factors contributes to the development of mathematical thinking, practical problem-solving, and independent thinking competencies among primary school pupils.

List of References

1. Karimova, N. (2021). Boshlang‘ich ta’limda matematik tafakkurni rivojlantirish metodlari. Toshkent: Fan va taraqqiyot.
2. Jo‘rayev, M. (2020). “Matematika savodxonligini shakllantirishda innovatsion texnologiyalarning roli”. – Ta’lim va innovatsiya jurnali, №4, 56–60-betlar.
3. Xolmatova, D. (2019). Boshlang‘ich ta’lim metodikasi. Samarqand: SamDU nashriyoti.
4. Shodmonov, R., & Abduvaliyeva, S. (2022). “Matematika ta’limida funksional savodxonlikni rivojlantirishning nazariy asoslari”. – Pedagogika va psixologiya jurnali, №2, 34–39-betlar.
5. Qodirova, M. (2023). O‘quvchilarda mantiqiy fikrlashni shakllantirishning psixologik asoslari. Buxoro: BuxDU nashriyoti.
6. Vygotskiy, L. S. (2005). Bola psixologiyasi va ta’lim. Moskva: Pedagogika nashriyoti.
7. OECD (2019). PISA 2018 Assessment and Analytical Framework: Mathematics, Reading, Science and Financial Literacy. Paris: OECD Publishing.
8. Polya, G. (2014). How to Solve It: A New Aspect of Mathematical Method. Princeton University Preschool.