Reflection Article

Teaching Strategies for Improving Logical-Mathematical Learning in Elementary School Students

Estrategias pedagógicas para la mejora del aprendizaje lógico-matemático en estudiantes de primaria

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Abstract

The main objective of this reflective article is to explain why it is crucial to apply logical-mathematical learning methods to facilitate students' understanding of complex subjects. The basic skills acquired in elementary school form the foundation for improving competencies related to abstract thinking. Therefore, we can expect children to use multiple techniques to build a deep understanding of both the exact sciences and other subjects. This paper offers some fundamental recommendations on how to help students improve their mathematical abilities using numerical operations, games, tools, and challenges. Furthermore, a vital aspect of successful learning is ensuring children's engagement. For many of them, expressing their opinions on relevant issues is part of the nature of logic. Finally, the right combination of traditional and modern models can enable teachers to create dynamic lessons. Thus, thanks to these approaches, it is possible to raise students' level of logical-mathematical skills and help them master various techniques for solving math problems.

Keywords: Mathematics achievement; Mathematical logic; Elementary mathematics; Mathematical skills; Mathematics education (Source: ERIC)

Resumen

El objetivo principal de este artículo de reflexión es explicar por qué es crucial aplicar métodos de aprendizaje lógico-matemáticos para facilitar la comprensión de asignaturas

complejas por parte de los alumnos. La habilidad básica adquirida en la escuela elemental constituye la base para mejorar las competencias relacionadas con el pensamiento abstracto. Por lo tanto, podemos esperar que los niños empleen múltiples técnicas para construir una comprensión profunda tanto de las ciencias exactas como de otras materias. Este trabajo ofrece algunas recomendaciones fundamentales sobre cómo ayudar a los alumnos a mejorar sus capacidades matemáticas utilizando operaciones numéricas, juegos, herramientas y desafíos. Además, un aspecto vital para la formación exitosa es garantizar la implicación de los niños. Para muchos de ellos, expresar sus opiniones sobre cuestiones pertinentes forma parte de la naturaleza de la lógica. Por último, la combinación perfecta de modelos tradicionales y modernos puede permitir a los profesores crear clases dinámicas. Así, gracias a estos enfoques, es posible aumentar el nivel de habilidades lógico-matemáticas en los alumnos y hacer que dominen diversas técnicas para resolver problemas de matemáticas.

Palabras clave: Organización de clases, Andamiaje, Innovación pedagógica, Actividades de aprendizaje, Estilos de enseñanza, Estrategias educativas. (Fuente: ERIC)

1. Introduction

Learning logical-mathematical reasoning is one of the essential aspects of children's education in primary school, as it stimulates interest in mathematics and helps students acquire knowledge of numerous mathematical concepts. Furthermore, since mathematical skills have a significant influence on future academic success, it is crucial to pay close attention to their foundations during the early stages of learning. Duncan et al. (2007), after analyzing six longitudinal studies, concluded that mathematical skills at school entry are the strongest predictor of later achievement in this area. Therefore, it is essential to strengthen mathematical skills during the early years of schooling by using a variety of methods to actively engage students.

However, logical-mathematical skills also contribute to human development and success because they form the foundation for acquiring other skills and knowledge. According to Cango et al. (2026), it is essential to focus on the development of abstract thinking from early childhood, as it enables the understanding of complex concepts. If children fail to acquire certain abstract thinking skills, this may have adverse effects on multiple areas of their lives, such as a lack of interest in education or difficulty understanding specific concepts and objects. Furthermore, Loor et al. (2026) argue that a child's development during early childhood largely shapes the course of their future life. Consequently, if essential logical-mathematical thinking skills are not acquired, children's ability to count, classify objects, and organize them according to specific criteria may be negatively affected. These abilities are necessary in nearly all areas of human activity. As a result, it is important to consciously apply a variety of techniques to enhance logical thinking and basic mathematical skills through diverse learning activities rather than relying solely on traditional lecture-based instruction.

Otherwise, without a combination of games, instructional tools, and other motivating elements that can stimulate students' interest, mathematics lessons may fail to engage children effectively, making it difficult to involve them in the learning process. The purpose of this

article is to explore why it is essential to use multiple approaches to strengthen logical-mathematical reasoning in primary school children and to identify other areas that may be influenced by this type of learning.

2. Method

First, it is essential to make students aware that mathematics is built upon foundational concepts, the early mastery of which has a positive impact on future achievement. Based on this idea, Duncan et al. (2007) concluded that it is crucial to develop these foundations during primary education. This highlights the need to introduce classroom methodologies that, from a pedagogical perspective, establish the necessary foundations to support future success in science-related and analytical subjects.

In the long term, mathematics learning activities should be designed in such a way that students can progress through a series of structured stages, moving from perception to conceptualization and then to symbolic and verbal expression. In this regard, Cango et al. (2026) demonstrated that difficulties encountered during the early stages may lead to deficiencies in understanding complex concepts and reduced classroom engagement. Therefore, it is essential to implement activities that encourage students to use mental models to organize, classify, perceive, and describe objects and events, gradually fostering more advanced abstract thinking. Ultimately, researchers agree on the importance of developing activities that enable students to construct their own meanings and establish relationships among different mathematical concepts.

In this context, the use of games in mathematics classes has become a widely adopted strategy for promoting mathematical thinking. Ramani and Siegler (2008) found that board games focused on numerical concepts improved children's understanding of numerical magnitude, number-line estimation, counting skills, and number recognition. More specifically, Siegler and Ramani (2008) recommended the use of board games incorporating number lines to support the development of mathematical knowledge in children. Consequently, it can be argued that play, when aligned with specific educational objectives, serves as a valuable resource for increasing student engagement and enhancing mathematical learning.

In addition to play-based learning, another strategy for fostering mathematical thinking involves the use of manipulative instructional materials in the classroom. According to the meta-analysis conducted by Carbonneau, Marley, and Selig (2013), which reviewed 55 scientific studies, there is a significant, though relatively small, difference between students who receive instruction using manipulatives and those who rely primarily on memorizing mathematical procedures. This conclusion differs somewhat from the perspective proposed by Laski et al. (2015). Both viewpoints agree that not all manipulatives possess the same pedagogical value, as some may have only a limited effect on student achievement. In fact, Laski et al. (2015) argued that the use of specific manipulatives designed to practice mathematical skills does not always justify the time invested compared with activities more directly focused on mathematical reasoning. In this sense, the effectiveness of manipulatives depends largely on teacher mediation, particularly through questions, instructions, and explanations

that connect hands-on activities with mathematical concepts.

Another strategy for introducing elementary mathematical thinking is to design activities that implicitly incorporate challenges. According to Mantuano and Pacheco (2026), such activities can promote logical-mathematical thinking because intellectual curiosity tends to increase motivation and encourage more active participation in the classroom. Furthermore, these challenges do not necessarily need to be presented explicitly; they can be embedded within conditions or constraints associated with a given situation. In other words, challenge-based activities can be designed so that students have opportunities to identify patterns, formulate hypotheses, make decisions, and propose solutions to different problem situations.

It is also important to consider the incorporation of technological devices into classrooms to create more adaptive and interactive learning environments. Tokac et al. (2019), after reviewing 24 studies on mathematics achievement and the influence of video games among students from preschool through secondary education, concluded that video games, when used merely as a supplement to conventional instruction, could lead to a moderate decline in mathematics achievement.

Akçay et al. (2022) published a study that analyzed various experimental investigations concerning the impact of digital technologies on the mathematics performance of primary school students. The objective was to obtain a comprehensive understanding of mathematics achievement within digital classroom environments. In this context, new technologies can serve as valuable educational resources for current and future generations, provided that their implementation is guided by clearly defined pedagogical objectives. Crespín et al. (2026) demonstrated that artificial intelligence can be used in the classroom to support differentiated instruction and promote greater student engagement.

Similarly, Guanoluisa et al. (2026) reported that technological tools can have positive effects on mathematics acquisition and achievement while also enhancing understanding and motivation in the classroom. Nevertheless, these benefits require effective teacher mediation and the integration of human interaction into the learning process.

Motivation represents another key factor in mathematics learning. Smart and Linder (2018) developed and validated an instrument designed to assess different constructs related to mathematics motivation among primary school students. Likewise, Avğin and Ergen (2025) conducted a study involving 429 primary school students to examine the relationship between mathematics motivation and problem-solving ability.

The authors identified a significant relationship between motivation and students' willingness to engage in learning. Taken together, these studies highlight the importance of implementing pedagogical strategies that enhance motivation and encourage students to develop their problem-solving abilities in mathematics.

As a complementary strategy, robotics can also be incorporated into mathematics teaching processes. Sacon et al. (2026) suggest the use of robots in primary school classrooms as a resource for facilitating the learning of mathematical concepts.

Similarly, Rolón-Pérez et al. (2026) emphasize the effects of physical exercise on brain functioning, including aspects related to memory and logical-mathematical thinking. In this regard, sports activities, robotics projects, and various extracurricular initiatives can contribute to the development of cognitive skills and promote learning experiences focused on problem-solving. Therefore, combining traditional and innovative strategies may represent an effective approach to enriching mathematics education during primary schooling.

Based on the foregoing discussion, Figure 1 presents a synthesis of the key concepts and findings addressed previously.

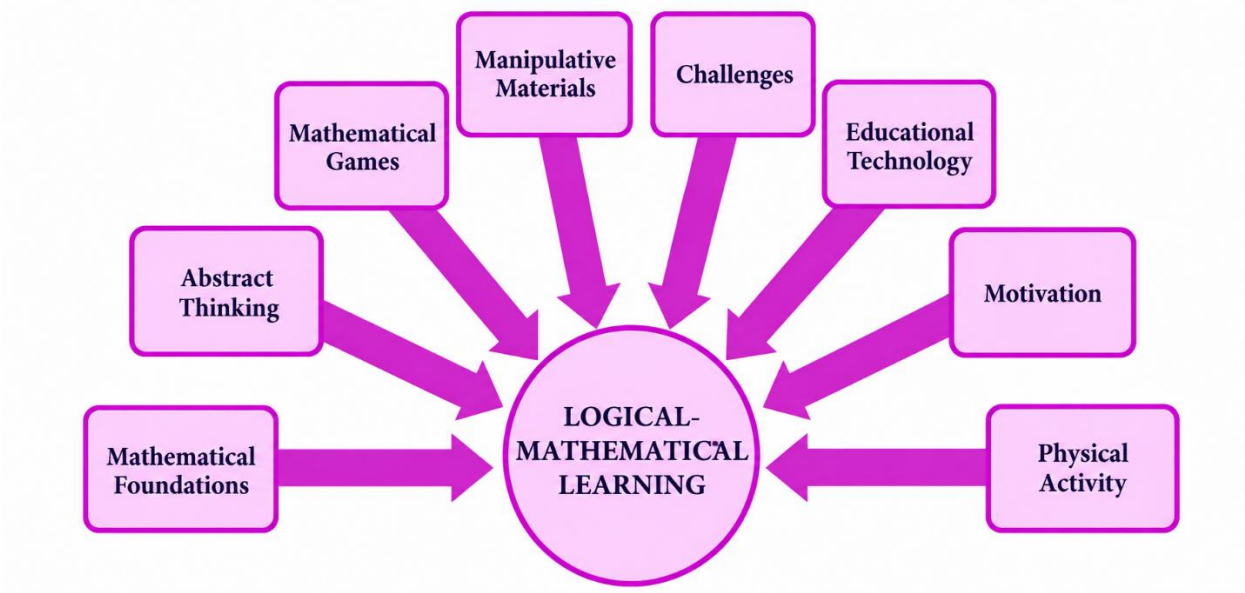

Figure 1. Pedagogical Strategies to Foster Logical-Mathematical Learning. (Source: Authors' Own Work.)

3. Conclusions and Practical Application

The way logical-mathematical learning is approached in primary education should not be limited solely to the memorization of algorithms or the application of patterns; it should also promote exploration, inquiry, comparison, manipulation, analysis, problem-solving, and knowledge construction. From this perspective, it can be inferred that learning strategies can be used to achieve positive outcomes due to their potential to contribute to the development of multiple skills. Educational games, manipulative materials, challenges, video games, technological resources, robotics, and physical games can serve as valuable tools for strengthening learning. However, their implementation should be guided by a clear pedagogical purpose and a specific learning objective established by the teacher. Therefore, these aspects should be carefully considered when designing and implementing such activities in the classroom.

Mathematics learning in primary school requires special attention because it involves not only the development of logical-mathematical skills but also students' interest and engagement with the subject matter. To address this need, it is appropriate to integrate traditional practices with educational innovations in

order to provide greater flexibility in the teaching and learning process. In this way, students can be supported in developing a new mathematical culture, enriched by diverse perspectives, strategies, and ways of thinking that foster a deeper and more meaningful understanding of mathematical concepts and content.

References

Acosta Guanoluisa, F. V. (2026). Impacto de las herramientas digitales en el aprendizaje de las matemáticas en estudiantes de educación básica: Impact of Digital Tools on Mathematics Learning in Elementary Education Students. Revista multidisciplinaria UNNIVAL, 4(1), 77–97. https://doi.org/10.70577/unnival.v4i1.90

Akçay, A. O., Karahan, E., & Bozan, M. (2022). The effect of using technology in primary school mathematics teaching on students' academic achievement: A meta-analysis study. FIRE: Forum for International Research in Education, 7(2), 1–21.

Avğin, İ., & Ergen, Y. (2025). The relationship between mathematics motivation and Mathematics Problem-solving skills of primary school students. International Online Journal of Primary Education, 14(2), 32–47. https://doi.org/10.55020/iojpe.1684284

Carbonneau, K. J., Marley, S. C., & Selig, J. P. (2013). A meta-analysis of the efficacy of teaching mathematics with concrete manipulatives. Journal of Educational Psychology, 105(2), 380–400. https://doi.org/10.1037/a0031084

Duarte Cango, A. X., Calapucha Alvarado, J. L., Montelongo Astorga, L., & López Delgado, I. C. (2026). Procesos cognitivos en matemáticas avanzadas y la construcción del pensamiento abstracto en el ámbito universitario: una mirada desde la didáctica y la epistemología. Sage Sphere Multidisciplinary Studies, 3(1), 1–19. https://doi.org/10.63688/29ctha57

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. Developmental Psychology, 43(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428

Laski, E. V., Jor'dan, J. R., Daoust, C., & Murray, A. K. (2015). What makes mathematics manipulatives effective? Lessons from cognitive science and Montessori education. SAGE Open, 5(2). https://doi.org/10.1177/2158244015589588

Ramani, G. B., & Siegler, R. S. (2008). Promoting broad and stable improvements in low-income children's numerical knowledge through playing number board games. Child Development, 79(2), 375–394. https://doi.org/10.1111/j.1467-8624.2007.01131.x

Sacon, K. G. Z., Zurita, N. L. P., Morán, D. E. M., Torres, F. L. T., Coello, I. M. R., & Holguín, E. H. P. (2026). Enseñanza de robótica y matemáticas en la educación básica: Enfoque integrador para el desarrollo de competencias. South Florida Journal of Development, 7(4), e6323. https://doi.org/10.46932/sfjdv7n4-004

Siegler, R. S., & Ramani, G. B. (2008). Playing linear numerical board games promotes low-income children's numerical development. Developmental Science, 11(5), 655–661.

https://doi.org/10.1111/j.1467-7687.2008.00714.x

Smart, J., & Linder, S. M. (2018). Development, validation, and implementation of the elementary mathematics motivation inventory (EMMI): examining motivational constructs in elementary mathematics. Fields Mathematics Education Journal, 3(1). https://doi.org/10.1186/s40928-017-0005-7

Tokac, U., Novak, E., & Thompson, C. G. (2019). Effects of game-based learning on students' mathematics achievement: A meta-analysis. Journal of Computer Assisted Learning, 35(3), 407–420. https://doi.org/10.1111/jcal.12347

Vergara Loor, J., Cedeño Mendoza, H., & Loor Andrade, E. (2026). La importancia de la enseñanza de estrategias matemáticas en la edad temprana: The importance of mathematical strategy instruction in early childhood education. LATAM Revista

Yagual Crespín, M. E., Cayancela Pezo, T. M., Miranda Márquez, L. F., Yagual Crespín, T. E., & Yagual Crespín, B. M. (2026). La Inteligencia Artificial como Apoyo Didáctico en la Enseñanza de las Matemáticas en Estudiantes de Educación General Básica. Ciencia y Reflexión, 5(1), 1218–1235. https://doi.org/10.70747/cr.v5i1.1035

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