

The Influence of Mathematics Game-Based Learning on Elementary School Students' Learning Motivation : A Literature Review

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Abstract

Math as a subject is often considered difficult and boring. This can be influenced by learning motivation, where motivation is a key aspect that determines success in understanding mathematical concepts from an early age. This study aims to examine the influence of *Mathematics Game Based Learning* on the learning motivation of elementary school students through a systematic review of ten relevant research articles. This study uses the *Systematic Literature Review* (SLR) method with a qualitative descriptive approach through a selection of articles from Google Scholar published between 2021–2024. The selected articles were reviewed based on inclusion criteria, research focus, and relevance to the research objectives. The analysis was carried out thematically on 10 articles that met the inclusion criteria. The results of the study showed that educational games such as snakes and ladders, Kahoot!, Wordwall, and popular adaptation games were able to create a fun learning atmosphere and increase students' active participation. In addition, it was found that the attractive game design and the role of the teacher as a facilitator greatly influenced the effectiveness of the game in building learning motivation. The conclusion of this study confirms that *Mathematics Game Based Learning* is a potential approach to increase student motivation in mathematics learning in elementary school.

1. Introduction

Mathematics education is a compulsory subject in elementary school and is studied in almost all fields. But the reality that is happening today, there are still many people who view mathematics as a very boring and scary subject (Amir & Vebrianto, 2021). It is undeniable, students in elementary school are often afraid when getting mathematics subjects. Mathematics is a compulsory subject taught in elementary school and has an important role in various fields. However, many students still find it a difficult and daunting lesson, therefore interest and motivation to learn need to be increased.

Learning motivation is one of the factors in achieving learning goals and understanding concepts in mathematics learning. Mathematics learning that is not optimal and has not reached competency standards is caused by several factors, including a very influential one is the lack of student motivation to learn (Fatmawati, 2021). High motivation to learn can increase student activity so that optimal learning outcomes are obtained. Students' learning motivation plays an important role in the successful understanding of mathematical concepts.

The mathematics learning process in elementary school students should be able to increase students' motivation to learn. Increasing student learning motivation is homework and a demand for a teacher to apply various learning strategies and models to every teaching and learning activity with students (Ardi & Desstya, 2023). The game method can be a solution as a strategy to increase student learning motivation, able to create a fun learning atmosphere. The game method in mathematics learning can be a strategy for teachers to increase student learning motivation by creating an interactive and fun learning atmosphere.

Mathematics Game Based Learning can support the understanding of mathematical concepts. In the 21st century, educational games can be used as an alternative to teach students to think critically and improve their understanding of mathematics in a fun way (Yustina & Yahfizham, 2023). In this way, the math learning process can be designed by completing game challenges with math learning elements. *Mathematics Game Based Learning* develops students' abilities through solving game challenges combined with learning materials

The research conducted (Dayani Siregar & Sari Sitepu, 2023) discusses the influence of the Game – Based Learning model. The findings show that there is a positive influence of Mathematics Game Based Learning on student learning activities. The influence of Mathematics Game Based Learning in class V is shown from the results of the observation sheet. The research conducted by (Paulina et al., n.d.) discusses the effectiveness of Game – Based Learning. The findings of this study are that the Game – Based Learning model has the potential to be an effective and interesting learning method in the context of mathematics learning in elementary schools. However, some aspects and challenges need to be considered in detail in the implementation of the Game – Based Learning model.

The two previous studies have similarities with this study, namely examining the Game – Based Learning model in mathematics subjects. However, there is a difference in research focus between the previous study and this study. The first research focuses on student learning activities during mathematics learning. The second study focuses on students' attitudes and perceptions of mathematics learning after using the Game – Based Learning model. Both are still limited studies that summarize the types of games and the role of teachers in GBL mathematics at the elementary level. This research focuses on factors that can increase students' motivation to learn mathematics.

This study aims to examine the Game – Based Learning model on the learning motivation of elementary school students. The aspects studied are the application, factors and impact of Game Based Learning on student learning motivation in elementary school. The results of this study are expected to be a reference in developing a Game – Based Learning model in mathematics learning for elementary school students.

Study Literature

Types of Educational Games in Mathematics Learning

Educational games in elementary mathematics learning are classified into two main types, namely digital and non-digital games. The use of digital games can improve cognitive functions such as executive function, attention, concentration, self-control, empathy, and student group connections (Antonopoulou et al., 2022). Digital games are not only entertainment, but also support students' cognitive and social-emotional development. Some examples of digital games are Kahoot!, educaplay, wordwall.

Non-digital educational games can be an option in learning, especially for elementary schools with limited internet access. Some studies have shown that non-digital games can sometimes be more effective than digital games in certain contexts (Mukhlisoh, 2024) Manipulation of concrete objects, direct interaction, and involvement in non-digital educational games such as angklek, snake and ladder games can provide meaningful experiences in learning.

Motivational Components in Game-Based Learning

Game-Based Learning has the potential to increase student motivation through various components of game design that create active engagement. Components such as clear goals, multi-level challenges, and direct feedback allow students to realistically feel their learning progress. Learning that actively involves students in the learning process results in their achievements will be easier to realize (Hendiansyah, 2025) Therefore, Game-Based Learning can increase student involvement and can encourage motivation and learning achievement through meaningful and fun learning experiences.

Another component that plays a role is the social and emotional aspects of the game. Aspects of social development that can be developed in traditional games are that children can collaborate, have empathy, be responsible, honest, and conduct healthy competitions (Aulia & Sudaryanti, 2023) This shows that games not only function as a cognitive learning tool, but also as a means of character formation. Therefore, the integration of social aspects in game-based learning is essential to form students who are not only academically intelligent, but also emotionally and socially mature.

The Role of Teachers as Game-Based Learning Facilitators

In the use of Game-Based Learning in the learning process, teachers play the role of facilitators who direct the student learning process. teachers play the role of facilitators as well as leaders who ensure that the game runs according to the plan until the set deadline (Nikmah, 2025). Teachers have a role to maintain a balance between fun learning and the achievement of learning goals. The success of the implementation of Game-Based Learning depends on the ability of teachers to manage learning activities effectively.

Teachers also play a role in observing and providing guidance for students in the Game-Based Learning process. Teachers must understand student profiles such as student developmental levels, cognitive styles, and learning language (Permana et al., 2023). Teachers can tailor the type of game and learning approach that best suits the student's characteristics. The role of responsive and adaptive teachers is key in optimizing the effectiveness of Game-Based Learning in the classroom.

2. Results and Discussion

Based on the results of a review of 10 articles on the application of *mathematics game based learning*, a classification of the types of games used as learning media was carried out. The first type of game is a modified traditional game such as mathematical snake and ladder and angklek games applied to flat building materials. Through traditional games, students are expected to be able to see the application of mathematics in daily life, not just see mathematics as something abstract (Lailatul Firnanda & Dia Indah Sari, 2024). Therefore, traditional game media can be a solution for students to be able to improve their understanding of mathematical concepts. The next type of game is application-based games or *digital games* such as kahoot, wordwall, and marthquest. In digital games that are divided into certain levels, it provides opportunities for students to experiment, there is no worry when getting mistakes and student-centered learning (Susanto et al., 2024) So, the learning process can be fun.

Other games adapted for mathematics learning are Among Us and Squid Game. The use of this popular game shows a positive impact on students' motivation in mathematics. The artificial game created by the teacher is also an innovation in the mathematics learning medium of flat building tiles (Takbar) which is a modification of the snake and ladder game applied to the learning process of flat building materials. The characteristics of the Takbar game can be seen from the shape, color and rules of the game (Hamdani Maula et al., 2022) Through the creation of this game media, students get a diverse mathematics learning experience.

Table 1. Results of Systematic Literature Review Mathematic game based learning on learning motivation

| No | Indicator | Description |
|----|------------------------------------|--|
| 1. | Name of Researcher and Year | : Galih Kurniadi 2021 |
| | Game type | : Educational Games "Ular Tangga Matematika" |
| | Findings | : This study measured the average value of students' motivation before and after the use of Mathematic Game Based Learning through snake and ladder games in the learning process. The researcher said that Mathematic Game Based Learning through the game of snakes and ladders is liked by students because it can create activity-based interactions so that students enjoy playing activities while learning. |
| | Supporting factors | : Creating interaction in student activities with play while learning. |
| 2. | Name of Researcher and Year | : Ajeng Fani Yustina dan Yahfizham 2023 |
| | Game type | : Squid game and Among us |
| | Findings | : This research studies strategies to increase students' interest and engagement in mathematics learning. The result of this research is that the Game based learning method will have a good impact on students when teachers follow the times. |
| | Supporting factors | : The use of media that <i>is up to date</i> with current trends and needs. |

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| 3. | Name of Researcher and Year | : | Mahwar Alfian Nisa dan Ratnawati Susanto 2022 |
| | Game type | : | Wordwall |
| | Findings | : | This study focuses on the use of wordwall-based educational games, as well as examines factors that affect learning motivation. The results of this study show that there is a change in attitude after students use wordwall edugame media. |
| | Supporting factors | : | Edugame wordwall has a variety of eye-catching features and simple execution |
| 4. | Name of Researcher and Year | : | Dini Farichatus Sholikha, Akhwani, Siti Marwati 2023 |
| | Game type | : | Magic Hour Box |
| | Findings | : | This study carried out class actions on the application of <i>the Magic Hour Box</i> game, where the researcher acted as a model teacher while the class teacher as an observer. The results of this study are From 2 cycles of action (the first cycle uses the lecture method, the second cycle implements the game based learning model n using Magic Hour box props), the researcher analyzes that there is an increase in each cycle |
| | Supporting factors | : | The learning method used by the teacher is according to the characteristics of the students. |
| 5. | Name of Researcher and Year | : | Sahira Dina Nur Fitria, Ibadullah Malawi, Endang Sri Maruti 2024 |
| | Game type | : | Game Mathquest (Mathematic Adventure Quest) |
| | Findings | : | This study examines the impact of mathematic adventure quest games on students' motivation to learn mathematics. The results of this research are from various types of educational games that are applied to help students understand the concept of mathematical concepts better, as well as develop self-regulated learning and cognitive skills. |
| | Supporting factors | : | The suitability of learning activities with the characteristics of students. |
| 6. | Name of Researcher and Year | : | Siti Fatonah dan Zahratun Naemah 2022 |
| | Game type | : | Games Education 'Angklek' |
| | Findings | : | This study conducted an experiment on angklek games as games education in mathematics learning of flat building materials in grade IV. The results of the study were carried out with statistical calculations showing that there was an influence of angklek games as games education on students' learning motivation in mathematics learning of flat building materials in grade IV |
| | Supporting factors | : | Suitability of the game with the material being taught |
| 7. | Name of Researcher and Year | : | Ni Wayan Pitriani, Nyoman Dantes, Sariyasa 2024 |
| | Game type | : | Game Kahoot! |
| | Findings | : | This study analyzes Kahoot orientation as a game-based learning model. The results of this study showed a smaller significance of 0.05 in the Kahoot-oriented game-based learning model on motivation that had been analyzed with anava. |
| | Supporting factors | : | Active participation of students in learning. |

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|-----------|------------------------------------|---|--|
| 8. | Name of Researcher and Year | : | Sinta Devi Kusuma Ardi, Anatri Desstyia 2023 |
| | Game type | : | Snake and Ladder Learning Media |
| | Findings | : | This research developed a snake and ladder game board as a learning medium. The result of the development of this media is that it can improve students' numeracy skills compared to the classical method. |
| | Supporting factors | : | Choosing the right time to use the Snake and Ladder Learning Media |

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| 9. | Name of Researcher and Year | : | Hayu Ika Anggraini, Nurhayati, Shirly Rizki Kusumaningrum 2021 |
| | Game type | : | Digital Game Based Learning (DGBL) |
| | Findings | : | This research through literature review analysis describes the use of mathematical games in improving the mastery of reasoning and numeracy skills. The results stated that interactive math games have a positive impact with a fun learning process that can motivate students. |
| | Supporting factors | : | A good mix of learning and play concepts |

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| 10. | Name of Researcher and Year | : | Novianti, Luthfi Hamdani Maula, Arsyi Rizqia Amalia 2024 |
| | Game type | : | Takbar "petak bangun datar" (flat building square) |
| | Findings | : | This study carried out class actions using the learning media "flat building tiles". This research conveys the success of increasing motivation through the use of "flat building tiles" media which is seen from the achievement of the completeness of the values that have been determined in cycle II |
| | Supporting factors | : | Variety of activities in the game |

2.1. The Impact of Applying the Game Method

The results of this study show that the application of mathematics game based learning has a positive impact on increasing student learning motivation. This is in line with research conducted by (Yonanda et al., 2025) Some of the benefits of game-based learning media are increased learning motivation and a better understanding of mathematical concepts. In this learning model, students are actively involved so that students can easily receive an understanding of math-ematical concepts.

Mathematic game-based learning facilitates students to be actively involved in the learning process, a collaborative learning atmosphere. In game activities, students feel that they are playing so that they can change the impression of learning mathematics which is known to be difficult. As said by (Amir & Vebrianto, 2021) there are still many people who view mathematics as a very boring and scary subject. The role and contribution of *Mathematic game-based learning* to the motivation aspect is that through this method, students' interest and curiosity increase. As stated by (Syaikhu et al., 2022) Snake and Ladder as a learning medium is a medium that can involve students and stimulate students' interest in learning, so that students are more motivated to learn and work on practice questions for each number in the Snake and Ladder box.

2.1.1. Motivational Enhancement Factors

The application of Mathematic game based learning to learning motiva-tion has a positive effect due to several factors. The first factor that supports the effectiveness of game-based learning is the appropriate game design, starting from the game theme, levels or levels, and attractive visual design. The results of the study (Subhan et al., 2025) stated that the researcher's experience in the field noticed that students felt at home and were interested in participating in learning in the classroom when they were shown visual media. The second factor is the role of teachers in the man-agement of learning activities. In the game-based learning process, teachers play the role of facilitators (Dina et al., 2024).

2.2. Conclusion

Based on the results of a review of 10 articles that examined Mathematics Game Based Learning in mathematics learning in elementary school, it was concluded that this learning model has the potential to change students' perspectives and experiences in mathematics learning. The application of Mathematics Game Based Learning allows for the transformation of passive cognitive learning into an active and enjoyable learning process for students. In the learning process, student motivation is not only built by the content of the learning material, but motivation is built through interactive and collaborative learning experiences.

This research provides an understanding of the role of Mathematics Game Based Learning in building students' motivation to learn deeply, not only depending on external stimuli but also the inner drive to understand mathematics. These findings open up opportunities for the development of better and culture-based learning media. Further research needs to be conducted to explore the long-term influence and adaptation of games on students' learning styles.

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Declaration of Conflicting Interests

Declarations of interest: none

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