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The Influence of the Use of Educational Game Learning Media "Snake and Ladder" on Mathematics Learning Outcomes Elementary School Students

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A B S T R A C T

This study compares results from several sources published between 2016 and 2024. The method used is PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analysis). This research includes an analysis of the title, abstract, introduction, methodology, results, discussion, and conclusions from the included sources. The research results have an average effect size of 1.36 in the high category. The high effect size shows that using snakes and ladders learning media effectively improves mathematics learning achievement in elementary schools.

Introduction

Education is the first essential foundation for achieving a successful future. With education, children can develop their cognitive and social abilities so that they are ready to progress to a higher level of education (Khoridha et.al.., 2022). The achievement of learning outcomes is inseparable from the learning process that involves the interaction of individuals with their environment, which results in

behavioral changes as a result of the process. These changes reflect mental development in different dimensions such as cognitive, affective, and psychomotor (Novyani et.al., 2023). This view shows consistent behavior patterns are the most important aspect of learning outcomes. The behavioral changes observed in individuals are evidence that individuals have succeeded in learning. Teachers' use of teaching materials significantly affects learning outcomes (Syafria et al., 2023).

Mathematics is an important field of study in primary education, as it allows students to develop critical, logical, and systematic thinking skills and improve their ability to perform calculations. This subject is also relevant to everyday life, contains elements of logical reasoning, and involves numerical problem-solving. Although mathematics is abstract because objects and their symbols are not always present in real life, learning mathematics involves understanding concepts and conceptual structures and developing relationships between concepts and their structures (Ilham dkk., 2023).

Based on previous research at SDN 104241 Syahmad, it can be seen that students' mathematics learning achievement still shows a low and unsatisfactory level of achievement. This situation is caused by the Mathematics learning strategy that still adopts the conventional model (Teacher Center) (Andriani Sitohang & Sukmawarti, 2023). Previous research at SD Cluster VIII Sukawati also showed that the method at the school still relies on conventional approaches, such as expository lectures. According to Suyatno's opinion (2009:60), This model fully focuses students' attention on the teacher, who plays an active role in delivering the material. Students only show a passive attitude by listening to the explanations given by the teacher (Nopiani dkk., 2013). When teachers deliver material through lectures, students tend to be more passive by listening to the lectures. Some students also showed a lack of interest in listening to the teacher's explanation due to the dominance of the teacher's role in the classroom (Andriani Sitohang & Sukmawarti, 2023). In addition, using less interesting and innovative learning media can make students feel bored and less actively participate (Syahfitri & Rambe, 2023).

A teacher needs to pay extra attention to how learning materials are delivered so that they are easy for students to understand and can motivate them to be active in the learning process. The same applies to mathematics teaching, where a teacher must have the skills to explain mathematical concepts clearly so that students can understand well what is being taught (Andriani Sitohang & Sukmawarti, 2023). Effective learning should be able to inspire meaningful and enjoyable learning activities. According to Ismail (2006), The learning approach through play is a method of teaching material to children in a fun way, so that they can gain knowledge and experience without feeling forced into the learning process (Afifah & Hartatik, 2019). To achieve success in the teaching-learning process to achieve learning goals, it is important to implement effective teaching strategies (Anjella dkk., 2023).

After finding these weaknesses, one of the strategies to overcome these problems is to utilize learning media such as snake and ladder games that allow students to interact

actively (Agustini et al., 2024). The purpose of using this snake and ladder game is to stimulate active student involvement, increase learning motivation, and develop students' ability to express opinions, which is expected to improve their learning achievement. In addition, the reason for using this learning medium is to train students in critical thinking, hone their ability to express opinions and get them used to solving problems through discussion (Mahmudah & Suharsono, 2021). Educational game tools include all objects that can be used as tools or equipment in the game, providing educational value and supporting the development of various abilities (J. P. Putri et al., 2023). Games are often challenging and are an important way for children to learn. The use of snake and ladder game media in learning is expected to effectively communicate material and explain the concepts to be taught. The game media will be well-designed to attract students' interest and encourage them to actively participate in learning (Tarigan et.al., 2024).

Each type of learning media has its own advantages and disadvantages. According to Satrianawati (2018:72), one of the advantages of snake and ladder game media is its inclusion in thematic learning. This attraction encourages students' interest in learning by allowing them to play during learning, the direct participation of children in the learning process, and its ability to help the development of various aspects of children, including mathematical logic intelligence and the ability to solve problems indirectly. Meanwhile, according to Satrianawati (2018:73), the disadvantages of snake and ladder game media include difficulty in completing the game on time because of the risk of students falling if they find a snake's tail, extra time needed to explain the rules of the game to children, limitations in developing all learning materials, potential chaos due to lack of understanding of game rules, and difficulties experienced by children who do not understand the material well in playing The game (Ilham et al., 2023).

Learning often prioritizes lectures that only rely on theoretical explanations without utilizing media and aids. This kind of learning approach is inappropriate and ineffective in improving student learning achievement, especially in grade 5 of SDN 104241 Syahmad (Andriani Sitohang & Sukmawarti, 2023). In addition, the problems experienced are similar. When the teacher teaches, some students still engage in conversations with their friends, and some remain silent without fully understanding the teacher's explanation. However, not all students show this behavior because there are still those who focus on paying attention to learning (Hardiana et al., 2015). This study aims to assess whether the application of educational game-based snake and ladder learning media has a meaningful influence on students' mathematics learning outcomes.

Research Method

This study uses a quantitative statistical approach that integrates several research results to assess the effect size (Anjaswantil et.al., 2022), which generally uses the PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) method. PRISMA is a minimum evidence-based guideline designed to assist authors in reporting different types of systematic

reviews and meta-analyses that evaluate the quality of research. PRISMA prioritizes ways to ensure that the reporting of this type of research is transparent and comprehensive (Sastypratiiwi & Nyoto, 2020).

The primary study of this article uses several databases, such as Google Scholar, Publish or Perish, and Semantic Scholar. Only research published in Indonesian or English between 2016 and 2024 will be included, provided it is fully accessible and available in open access. The keywords used in the search include "snake and ladder learning media," "learning outcomes," "mathematics," and "elementary school." The selected research must meet the following criteria for tracking methods: (1) in the form of experiments, (2) conducted in Indonesia, (3) involving elementary school students, (4) focusing on mathematics, and (5) using snakes and ladders. (Rahma et.al., 2022).

In comparing the effects of the use of "Snake Ladder" learning media as an educational game on the mathematics learning outcomes of elementary school students, some aspects or dimensions analyzed are as follows. First, mathematics learning achievements. Second, understanding the concept. Third, the ability to solve problems. Fourth, numeracy skills. Finally, competency knowledge. All of these dimensions provide a comprehensive overview of the impact of the educational game "Snake Ladder" on the mathematics learning outcomes of elementary school students.

Result and Discussion

Based on the data that has been analyzed, the effect size obtained from 20 journals can be classified based on all categories and dependent variables as shown in the following table:

Table 1. Data on the results of the grouping of effect sizes based on all categories

No.	Author, Year	Article Code	Effect Size	Category
1.	Firdaus, et.al. (2024)	A13	3,59	High
2.	Vira Febrianti, et.al (2022)	A3	2,82	High
3.	Yohanes A.W., et.al (2019)	A19	2,57	High
4.	Imam Baiquni (2016)	A12	1,46	High
5.	Sulis Indrayani L., et.al (2023)	A7	1,34	High
6.	Masrukah, et.al (2020)	A11	0,95	Medium
7.	Irfan Rizki Nugroho, et.al (2018)	A17	0,94	Medium
8.	Suparji Rustam, et.al (2021)	A16	0,83	Medium
9.	Allinda Dwimartaet.al(2023)	A15	0,83	Medium
10.	Ni Wayan M, et.al(2017)	A20	0,75	Medium
11.	Zahrotun Khamidah, et.al. (2023)	A2	0,74	Medium
12.	Lisa Apriyanti, et.al(2019)	A1	0,64	Medium

13.	Ni Kd. Dewiyanti, et.al. (2018)	A10	0,20	Low
14.	Erfina Yulia Wardan, et.al (2020)	A4	-	Unknown
15.	Ika Apriliani Putri, et.al (2022)	A5	-	Unknown
16.	Pipin Dwi Saputri, et.al. (2022)	A6	-	Unknown
17.	Kikit Anggreany N., et.al (2023)	A8	-	Unknown
18.	Firda Zulfana, dkk. (2020)	A9	-	Unknown
19.	Windi Nur Anisa, et.al. (2023)	A14	-	Unknown
20.	Arumsari Okta I., et.al. (2022)	A18	-	Unknown
	Average		**1,36**	**High**

The table above shows that five journals are in the high category, seven journals are in the low category, one journal is in the low category and seven other journals whose effect size is unknown will be analyzed using a matrix. Overall, the average effect size of using Snake and Ladder learning media on mathematics learning outcomes was 1.36, which is a high value. The high size of this effect shows that the use of this learning media significantly influences mathematics learning outcomes.

Based on the results of the analysis, after conducting a study of dependent variables from 20 journals studied, the data were produced in the following table:

Table 2. Data from Effect Size Grouping Based on Bound Variables

No.	Research-bound variables	N Artikel	Rerata Effect
1.	Mathematics Learning Outcomes	13	1,47
2.	Concept Comprehension Ability	2	0,83
3.	Problem-Solving Capabilities	2	0,88
4.	Numeracy	2	2,57
5.	Knowledge Competencies	1	0,75
	Average		**1,30**

The effect size of snake and ladder learning media use is based on dependent variables from highest to lowest. The variable of numeracy ability is in the highest position. The next order is the variables of mathematics learning outcomes: variable problem-solving ability; variable concept comprehension ability, and knowledge competency variables. Overall, the average effect size is 1.30. This means that the level of effect of using snake and ladder learning media involving dependent variables is in the high category.

Table 3. Data Description (Matriks)

No.	Author	Title	Resume
The Use of Snakes and Ladders on Learning Outcomes			
1.	(Apriyanti & Gunawan, 2019)	"The Effect of the Snake and Ladder Game on the Mathematics Learning Outcomes of Grade IV Students at SDN 51 Bengkulu City"	The results showed that in the initial pretest, the average score of the control class was 42.17 and the experimental class was 44.42. In the final posttest, the average score of the control class increased to 59.43, while the experimental class increased to 68.92. There was an average score difference between the experimental and control classes in the posttest of 9.49.
2.	(K.N et.al., 2023)	"The Effect of Using Multi-Method Assisted by Snake and Ladder Media to Improve Student Learning Outcomes"	The results showed that the control class had an average pretest score of 52.34, while the experimental class had an average pretest score of 51.29. However, there was a significant change in the posttest results, where the average posttest score of the control class reached 77.90 and the experimental class reached 86.96. The average difference in posttest scores between the experimental and control classes was 9.06.
3.	(Febrianti et.al., 2022)	"The Effect of the Guided Inquiry Learning Model Assisted by Fractional Snake and Ladder Media on Students' Learning Outcomes in Mathematics Learning"	In the posttest assessment, the average score of the experimental class was 88.33, while the control class had an average score of 71.04. The average score difference is 17.29.
4.	(Wardan et.al., 2020)	"The Effect of Learning Through Snake and Ladder Games Assisted by	After the posttest assessment, it was recorded that the average score of the experimental class was 81.60, while the control class recorded an average score

		Visual Media on Mathematics Learning Outcomes of Grade IV Students of SDN Ngeblak, Bareng District, Jombang Regency"	of 73.60. The average difference in grades is 8.00.
5.	(I. A. Putri et.al., 2022)	"The Influence of Snake and Ladder Game Media on Mathematics Lessons at SDN 1 Pabuaranwetan"	The results showed that before the treatment, the average value was 40.00. However, after the implementation of the Snake Ladder game media, there was a significant increase in the average score of students to 70.00 in the follow-up assessment.
6.	(Saputri et.al., 2022)	"The Effect of the Use of Snake and Ladder Media on Student Learning Outcomes in Grade 5 Mathematics Learning at SDN 01 Manisrejo"	In the posttest assessment, it was recorded that the average score of the experimental class was 85.00, while the average score of the control class was 76.25. The difference in average scores between the experimental class and the control class was 8.75.
7.	(Lubis & Simbolon, 2023)	"The Effect of the Teams Games Treatment (TGT) Type Cooperative Learning Model Assisted by Snake and Ladder Media on the Learning Outcomes of Flat Building Mathematics in Grade IV Elementary School"	The results showed that before the intervention (pretest), the average score of the control class was 43.26, and the average score of the experimental class was 45.62. After the intervention (posttest), the average score of the control class increased to 54.35, while the average score of the experimental class increased to 75.83. The average score difference between the experimental and control classes in the posttest was 21.48.
8.	(Novitasari et.al., 2023)	"Smart ladder (snake) media to increase results Learn Mathematics for Elementary School Students."	The study's results showed that in the initial evaluation (pretest), the average score was 55.53. However, after being given The treatment using the snake and ladder game media, there was a significant increase in the average score of students to 84.82 in the next

			evaluation (posttest).
9.	(Zulfana et.al., 2020)	"The Effect of the Media Snake and Ladder Assisted NHT Model on the Learning Outcomes of Grade IV Students at SD N 02 Ujung Pandan Jepara"	The results of the study showed that the average score in the initial assessment (pretest) was 67.27. However, after the Snake and Ladder game intervention, the average score of students in the posttest increased significantly to 89.27.
10.	(Dewiyanti et.al., 2018)	"The Effect of the Learning Model of Teams Games Tournament (TGT) Assisted by Snake and Ladder Game Media on Mathematics Learning Outcomes"	The results showed that in the posttest evaluation, the average score of the experimental class was 79.35, while the control class was 72.85, with an average score difference of 6.50.
11.	(Masrukah et.al., 2020)	"The Effectiveness of Flat Building Patterned Snake and Ladder Game Media in Mathematics Learning"	In the posttest assessment, the average score of the experimental class was 77,333, while the control class was 65,667. The average score difference between the experimental class and the control class was 11.666.
12.	(Baiquni, 2016)	"The Use of Snake and Ladder Media on Mathematics Learning Outcomes"	In the posttest assessment, the average score of the experimental class was recorded at 78.00, while the average score of the control class reached 60.06. The average score difference is 14.00.
13.	(Musdalifah et.al., 2024)	"The Effectiveness of the TGT Type Cooperative Learning Model Assisted by Snake and Ladder Media on Mathematics Learning Outcomes Inpres Elementary School Students 5/81 Lemoape"	The results showed that the average score in the initial pretest was 31.54. However, after the intervention using the Snake and Ladder game media, there was a significant increase in the average score of students to 84.23 in the posttest Subsequent assessments.

The Use of Snakes and Ladders on Concept Comprehension Ability			
14.	(Anisa et.al., 2023)	"The Effect of Snake and Ladder Learning Media on Learning Outcomes and Concept Understanding in Mathematics Subjects for Grade IV Students of SDN Lebaksiu Kidul 04"	The results showed that in the initial assessment (pretest), the average score was 44.80. However, after using the snake and ladder game media as a treatment, there was a significant increase in the average score of students to 76.2 in the next assessment (posttest).
15.	(Dwimarta et.al., 2023)	"The Effect of the Inside Outside Circle Learning Model Assisted by Digital Snake and Ladder Media on the Understanding of the Flat Building Concept in Grade V Elementary School Students"	The results showed that in the posttest assessment, the average score of the experimental class was 80.50 while the control class was 75.50, with a difference in the average score between the two classes of 5.00.
The Use of Snakes and Ladders on Problem-Solving Skills			
16.	(Rustam et.al., 2021)	"The Influence of Mathematics Learning Media Using Banten Culture-Based Snake and Ladder Games and Learning Motivation on the Mathematics Problem Solving Ability of Grade IV Elementary School Students"	In the posttest evaluation, the results showed that the average score of the experimental class was 79.67, while the control class was 73.41. There is an average score difference between the two classes of 6.26.
17.	(Nugroho & Listyarini, 2018)	"The Effectiveness of the Teams Games Tournament (TGT) Assisted Learning Snake and Ladder Media Model on Mathematics Problem	The results showed that in the pretest, the average score of the control class was 39.40 and the experimental class was 44.60. However, there has been a change which is significant in the posttest, where the average score of the posttest of the control class reaches

		Solving Ability in Grade IV Elementary School"	71.90 and the experimental class reaches 86.70. There was an average score difference between the experimental and control classes of 14.8.
The Use of Snakes and Ladders on Numeracy			
18.	(Irmawati et.al., 2022)	"The Effect of the Make-A-Match Model Assisted by Snake and Ladder Media on the Numeracy Skills of Grade II Students of SD Negeri Sukosari, Bandongan District, Magelang Regency"	The results of the study showed that in the initial assessment (pretest), the average score was 72.83. However, after using the snake and ladder game media as an intervention, there was a significant increase in the average score of students to 87.00 in the subsequent assessment (posttest).
19.	(Ware & Anggraini, 2019)	"The Effectiveness of the Snake and Ladder Game to Improve the Numeracy Ability of Grade 2 Students of SDK Wetakara"	The results showed that the average score in the initial pretest was 4.2000. However, after using the game medium of Snake and Ladder as a treatment, there was a significant increase in the average score of students to 8.8000 on the next posttest.
The Use of Snakes and Ladders on Knowledge Competence			
20.	(Maretayani et.al., 2017)	"The Effect of Problem Solving Learning Model Assisted by Snakes and Ladders Games on Students' Mathematics Knowledge Competence"	The results showed that in the posttest assessment, the average score of the experimental class was 72.77 while the control class was 62.67, with a difference in the average score between the two of 10.10.

Based on the analysis of 20 journals in the matrix table, it was found that using this learning media affected students' mathematical abilities and academic achievements. This is evident from the higher scores in the experimental class compared to the control class. Therefore, the use of this learning media has an indirect positive impact on student learning

outcomes when compared to traditional teaching methods.

Even in other studies conducted by (Rahayu & Suryani, 2022) highlighted that the snake and ladder learning media increased students' understanding of concepts in science subjects. Further research conducted by (Septiani dkk., 2023) shows that this learning media affects English vocabulary skills. However, the data from the previous table show that the Snake and Ladder game significantly impacts students' numeracy skills and shows a significant difference in its effect on mathematics learning outcomes.

The purpose of the Ladders And Snakes game media is to increase student participation, motivation in learning, and confidence in expressing opinions, all of which can potentially improve student learning achievement. In addition, teaching media are chosen to train students' ability to think critically, express opinions actively, and develop problem-solving skills through discussion (Mahmudah & Suharsono, 2021). This game media will be well designed to attract students' interest and encourage them to be more active in the learning process (Tarigan dkk., 2024).

The Snake and Ladder learning media helps students understand the material being taught. This medium, as reflected in the previous 20 articles, is designed to engage students in the learning process in a way that is entertaining and encourages active participation. This statement aligns with the findings presented by (J. P. Putri dkk., 2023), that educational playground equipment includes everything that can be used as a tool or play device that has educational value and can develop children's skills as a whole.

Conclusion

The results of this study have an average effect size of 1.36 with a high category. The use of snake and ladder learning media has a high effect size. This is due to the ability of the Snake and Ladder game to encourage active and fun learning so that students can better understand the material and directly impact their learning outcomes in mathematics in elementary school. In addition, the media can also improve mathematical skills such as problem-solving skills, arithmetic, concept understanding, and cognitive skills. Therefore, Snake Ladder as a learning medium can effectively improve students' mathematics learning achievement.

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