How to Cite (APA Style):
Noviafitri, K. S., Huda, M., Mukti, T. S., & Yahya, F. H. B. (2024). Effect of interactive learning media: numeral snakes and ladders on clock reading and arithmetic operation for elementary students. *Jurnal Ilmiah Pendidikan Dasar*, 11 (2), 251-264. http://dx.doi.org/10.30659/pendas.11.2.251-264

JURNAL ILMIAH PENDIDIKAN DASAR
p-ISSN: 2354-9580
e-ISSN: 2685-211X

Effect of interactive learning media: numeral snakes and ladders on clock reading and arithmetic operation for elementary students

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Submitted: June 10th, 2024 **DOI: 10.30659/pendas.11.2.251-264**
Revised: July 20th, 2024
Accepted: July 26th, 2024

Keywords:
interactive learning media; numeral snakes and ladders; clock reading and arithmetic operation

Abstract

Learning media is important to support student learning achievements. Numeral Snakes and Ladders (NSL) is an interactive learning media innovation for elementary schools with an interesting and fun cooperative learning approach for students. This research aims to determine the effectiveness of media in learning and improve students' understanding of basic data literacy. The research used a quantitative approach with a quasi-experimental design. NSL Media was implemented at SDN Gebanganom, Kangkung District, Kendal Regency, with the entire student population in grade 4 and grade 5. Data collection was carried out using direct tests. The sampling technique for this research is saturated sampling. Data analysis was carried out using a paired sample T-test. The research results showed that by testing using the paired sample T-test, evidence was <0.05 obtained that the two groups before and after using NSL media experienced a significant increase. Apart from that, learning using NSL media can affect students' cognitive abilities, the effect can be concluded from the test increase from 78.2 to 82.1. The characteristics of students observed during the learning process are honesty, responsibility, and spiritual attitudes well developed. Apart from that, teachers can develop and direct social and spiritual skills and attitudes in learning in the hope that students can grow and develop according to their phases and have quality learning outcomes.

INTRODUCTION

Background of the Study

Quality learning cannot be separated from teacher competence, supporting learning tools, and the willingness to learn from teachers and students. The quality of learning today, from an integration perspective, is based on the viewpoints of both students and teachers. From the student's perspective, the quality of learning can be evaluated on the achievement of learning objectives according to their level of development. Meanwhile, from the teacher's perspective, quality learning means that students play an active role, are directly involved in learning, and experience a change in attitude toward maturity and independence. An integrated perspective is unity, so that in interpreting the quality of learning, teachers and students must be in line (Widiana et al., 2019). Thus, in practice, teachers will have a role in encouraging, educating, guiding, and directing students and being the spearhead in carrying out the mandate to achieve student learning goals.

Level of student learning achievement in research (Wati, 2021) It was concluded that one of the crucial things is that teachers have a vital role. Optimal learning outcomes for students can be achieved if teachers are competent to innovate the learning process and present many creations to make students active in the learning process. Innovation and creativity carried out by teachers in the learning process will trigger students' motivation to be enthusiastic in participating in learning (Mukti et al., 2023), and it will have an impact on increasing learning outcomes. The role of teachers in innovation and creativity is also strengthened in research (Kurniawan & Hasanah, 2021). Fauzi & Mustika (2022) also stated that an important factor in increasing learning outcomes is seeking varied learning that is interesting and enjoyable for students. One of the efforts to innovate and be creative that has been carried out in previous research is to apply relevant learning media.

Learning media is important to support student learning achievements. Learning media has a role as an intermediary in conveying important information. Apart from that (Rahim, 2022) states that media can make it easier for students to visualize and make understanding more quickly received by students. One of the important roles of the media is direct involvement, namely patterns of interaction between people and teachers so that students are better prepared to receive information (Zuniari et al., 2022).

Problem of The Study

Innovation in game-based learning media with the principle of fun learning increases student motivation, but more than that, learning carried out with innovation will provide meaningful learning for students. Based on Rusdewanti & Gafur (2014) research, found that the problem currently facing schools is the need for more availability of supporting media for learning.

The results of direct observation obtained at the research location show that the media used tends to be conventional and less interactive. Teachers are also less creative in presenting learning, so it is monotonous and boring. This statement is strengthened by the results of research from Abdullah (2017) which states that the creativity of educators in a subject in utilizing learning media could be more optimal. Researchers also found in observations that educators only use media in the form of books, whiteboards, and display media. Researchers also found this problem in a preliminary study at SDN Gebanganom, Kangkung District, Kendal Regency.

Researchers also found that teachers were reluctant to invite and direct students during the learning process. Teachers only quote lesson information from various sources without knowing its meaning and function. This condition is further exacerbated by staying in the comfort zone. Creative teachers develop ideas or behavior when learning becomes an important factor in achieving student achievement (Tuwa & Faraz, 2018).

Research's State of the Art

Innovative learning needs to be done with different developments and approaches. One of the approaches used in learning media innovation is games-based. Games in learning are expected to attract attention, and motivation (Salamah et al., 2024), especially elementary school students, to be more active and enthusiastic in learning. In this case, teacher creativity is very necessary to create an innovative and quality learning atmosphere in developing the potential and character of students (Nuryasana & Desiningrum, 2020). So the implementation of NSL learning media that specifically studies certain materials, namely clock reading and arithmetic operations, becomes novel in this research.

Learning media helps arouse students' interest and motivation to learn new things. Media will also make it easier for students to understand the material. The learning media used should be interactive. Confirmed in Suliani (2020), that students are more enthusiastic about participating in the learning process if there are teaching aids that can help their imagination to make it easier to understand the material.

Interactive media will involve students in their cognitive abilities, and psychomotor aspects and attitude aspects will be encouraged to develop. Interactive media will make students less likely to get bored in learning, thereby having an impact on improving students' abilities and character.

This game-based interactive media is available as a learning loss treatment for students. This opinion is also confirmed in research conducted by Marwa *et al*. (2020), that post-pandemic elementary school students need a fun learning approach. In this phase, elementary school students learn using play and fun schemes. In line with the results of research conducted by Citra & Rosy (2020) and Widiana *et al*. (2019), play media in packaged learning has increased students' active participation and cognitive abilities.

Novelty, Research Gap, & Objective

Based on these problems, researchers as implementers of the Teaching Campus Program need to make changes. Researchers will develop interactive learning media, which is expected to change student participation in learning and change cognitive abilities, attitudes, and skills. The game-based interactive learning media that will be developed and implemented is Numeral Snakes and Ladders (NSL). Yanti, Affandi, & Rosyidah (2021) states that playing Snakes and Ladders benefits students by stimulating children's intelligence and creativity, cultivating social attitudes, and cultivating an honest and responsible personality.

The development of this media is different from previous research. This difference lies in the use of materials that are easy to obtain so that teachers everywhere can replicate and use them in learning (Oli et al., 2024). Another difference with other snakes and ladders media is that this media was developed according to the learning needs of number operations material for elementary school students.

This research focuses on the implementation of NSL interactive learning media. This implementation is a solution step in improving the learning process at SD N Gebanganom. The implementation of NSL media is also based on students' needs for media to facilitate understanding and mastery of the subject matter (Moto, 2019). The NSL media used has been developed with economical principles and is easy to use so that the NSL media design can be replicated in any school. Thus, this research will determine the effectiveness of implementing NSL interactive media in improving students' abilities and increasing active participation during learning.

METHOD

Type and Design

The research used a quantitative approach with a quasi-experimental design. The researcher is part of the learning process as a Teacher Assistant or Teaching Practice Student in batch 5 on Program Kampus Mengajar of the Ministry of Education and Culture of the Republic of Indonesia in 2023. The research was conducted from May to June 2023 at SDN Gebanganom, Kangkung District, Kendal Regency.

Data and Data Sources

Researchers act as teachers with the authority to carry out learning to design, compile, evaluate, analyze, revise, and develop media while coordinating with the class teacher and school principal. The research was conducted in class 4 (consisting of 4 female and five male students) and class 5 (comprising six female and two male students). The sampling technique for this research is saturated sampling. This number of students is the entire population in the class. All populations in this study were used as research samples.

Data Collection Technique

The research used learning tools (lesson plans and student worksheets in NSL media) and test instruments. The test is a short essay to obtain the percentage of student learning outcomes in the Numeracy Literacy material.

Data Analysis

The researcher's position as a Teacher's Assistant is given special authority, so this research process always involves observers and supervisors from colleagues and teachers. The presence of observers and supervisors will carry out a supervisory function over the learning carried out by researchers.

The data obtained in the research was analyzed using quantitative descriptive techniques. This technique describes test result data before and after using NSL media and student learning observation sheets in the form of average scores, minimum scores, maximum scores, percentage of learning achievement, and narratives regarding implementing learning using NSL media. Meanwhile, the difference test is carried out with a *paired sample T-test* because the data from the pretest and posttest results are the same group object. This test will help prove whether learning using NSL media impacts changes and improvements in students' abilities.

RESULTS

Numeral Snakes and Ladders (NSL) media was developed with economic principles, hoping it would be easy to adopt and replicate by other teachers. NSL media is made from simple colored cardboard, which is then painted with pictures according to material requirements, containing pictures of stairs, snakes, clocks, and counting operations.

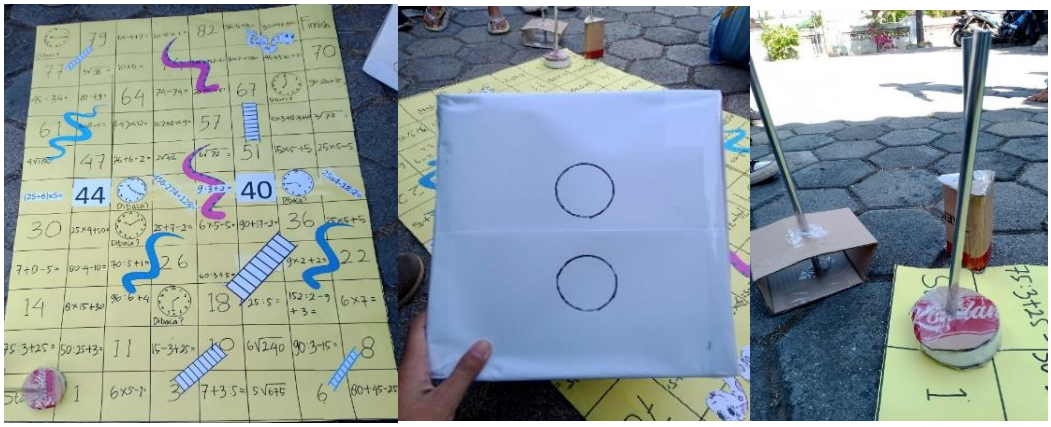

Figure 1. NSL Media, Dice, and Pion

Figure 1 shows the NSL media used in learning (a). NSL media consists of 72 plots containing numeracy literacy material. The learning that takes place using NSL media is the same as playing Numeral Snakes and Ladders, which requires Dice to draw the Pion steps for each student. (b) Dice are made from cube-shaped cardboard with 1-6 dice. Meanwhile, Pion (c) is made from rolled foam and cardboard. Every time a student stops at a plot containing a numeracy literacy problem, the student must solve it.

Learning with NSL media increases student enthusiasm and motivation for learning. Figure 2 shows that all students in the class are actively involved in learning. Students' enthusiasm for playing and avoiding boxes containing numeracy literacy problems. Because it is random, anyone who stops has to play fair and finish it. With this game, students will be encouraged to develop their character and social attitudes, namely responsibility and honesty (no cheating).

Figure 2. Learning activities with NSL

Learning using NSL Media consists of learning objectives: a) The students can read a Clock; b) The students can complete Arithmetic Operations. In the ongoing learning process, it was found that there was a significant increase in students' understanding of understanding and implementing Clock Reading and being able to complete Arithmetic Operations. Initially, students could not read a clock and needed help understanding counting operations. The results of students' work in solving literacy problems on the NSL media plot are presented in Figure 3.

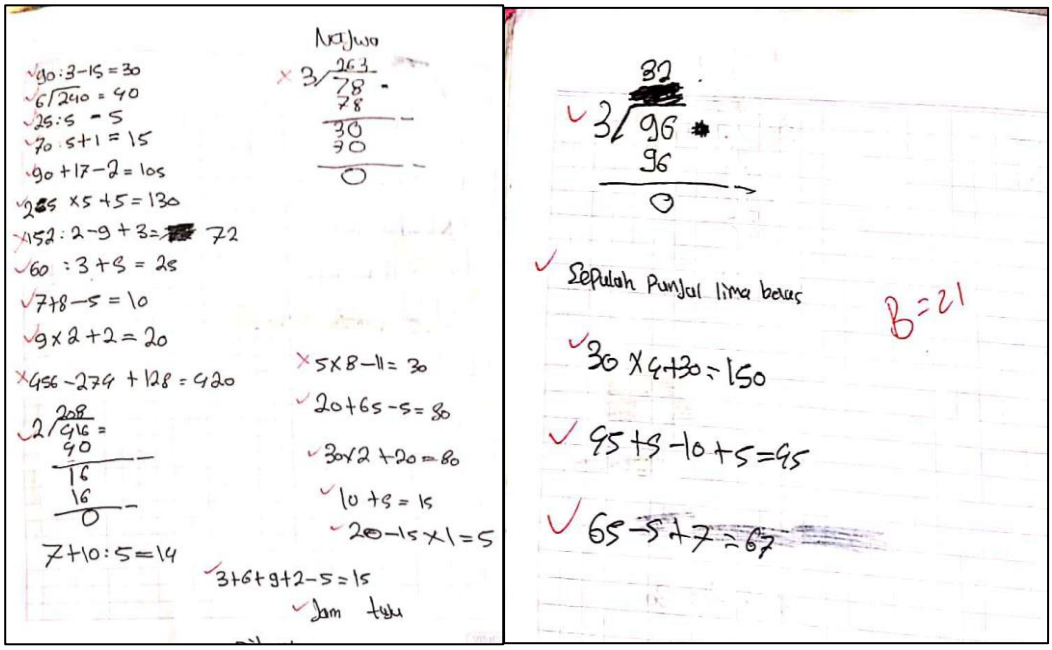

Figure 3. Student NSL worksheet

NSL media is implemented in learning in grades 4 and 5 of elementary school. Evaluation of student learning outcomes is presented in Table 1 as follows:

Table 1. Student Numerasi Learning Outcomes

Grade	Student	L/P	Before Using NSL	After Using NSL
4	Siswa_1	L	75	78
	Siswa_2	L	76	80
	Siswa_3	P	82	88
	Siswa_4	L	75	77
	Siswa_5	P	83	88
	Siswa_6	P	80	85
	Siswa_7	L	78	81
	Siswa_8	P	79	82
	Siswa_9	P	82	89
5	Siswa_10	P	78	83
	Siswa_11	P	77	82
	Siswa_12	P	76	78
	Siswa_13	L	70	73
	Siswa_14	L	70	75
	Siswa_15	P	82	85
	Siswa_16	P	88	90
	Average		78,1875	82,125
	Minimum		70	73
	Maximum		88	90
	p-value		3,29632E-08	

From the learning results table, there has been an increase in the average student score regarding Numeracy Learning Outcomes. When compared based on gender, the female population has a higher average value than the male population. In the two data groups, there was an increase in the lowest and highest values. Meanwhile, the hypothesis using *the paired sample t-test* showed that two groups of data from the same object showed that the p-value was <0.05, so H_0 was rejected, or there was a significant difference.

DISCUSSIONS

The research results show that the Numeral Snakes and Ladders (NSL) learning media effectively increases students' active participation and mastery of numeracy literacy in the sub-discussion of clock reading and arithmetic operations. It is proven by the increase in student numeracy learning outcomes (table 1). Before using NSL media, student learning outcomes regarding numeracy literacy were relatively low and below the KKM (Minimum Completeness Criteria). Factors that influence this condition are that students have experienced difficulties in the numeracy learning process due to the limited use of media as a learning tool and monotonous and unpleasant learning for students.

NSL media is the result of an analysis of the learning needs of grade 4 and 5 students at SDN Gebanganom Kangkung, Kendal Regency, as an alternative solution to learning problems in class. NSL media consists of several basic numeration parts: Arithmetic Operations about addition, subtraction, division, multiplication, and basic concepts of time (Clock). Primary school students must master the basics of numeracy because it is very useful in everyday life (Mahmud & Pratiwi, 2019). Practices in life that utilize the concept of numeracy literacy are telling time and calculating operations related to all social activities, for example, buying and selling. Students who master the basic concepts of numeracy literacy will be encouraged in their cognitive development to reason and think critically, logically, and systematically.

NSL media in learning accommodates fun learning based on games. Now we can call Gamification Learning. Not just playing snakes and ladders, but with this game, students will understand the concept of numeracy literacy (Cahyaningtyas et al., 2024). It shows that in each snake and ladder plot, there are problems that students must solve. If students experience problems completing the task, the teacher's role as a facilitator will guide and direct them until the students understand the existing concepts.

Learning with NSL media, according to the student's perspective, is very enjoyable. That is find the researchers by implementing the learning process. The NSL media used also makes it easier for students to understand the concept of Numeracy Literacy (Primasari et al., 2021), which has been considered "difficult." It is because students feel happy, motivated, and very enthusiastic to be actively involved in learning. In line with previous research, learning numeracy literacy for students could be more exciting and varied. It cannot be separated from the fact that the learning strategies used are not accompanied by creativity and innovation (Mowata et al., 2023).

Learning innovation using NSL media will change the atmosphere and increase the quality of learning. This is in line with the research results of Bujuri (2018) that interactive and innovative media can change the learning process to better quality. Other researchers also revealed that development research using the ADDIE model to create learning media that suits their needs has been proven to be able to improve students' abilities (Sari & Jupriyanto, 2023). Students' enthusiasm, motivation, and concentration increase so that, without exception, all students are actively involved in learning. The NSL media used in the learning series does more than just develop

students' cognitive abilities. Following Fitriyah & Wardani (2022) In learning, it is necessary to optimize all aspects of students' abilities, namely attitudes, and skills.

Cognitive aspects, attitudes, and skills developed in learning will create harmony in quality learning outcomes from the perspective of students and teachers. The concept of implementing NSL media is that it is carried out collectively. It is an effort to improve students' social attitudes and train students' sportsmanship (Marcela et al., 2022). Sportsmanship is a commendable attitude that needs to be instilled from an early age to grow into a person who can be relied on (Bangun, 2019). This attitude is very beneficial for yourself and the environment around you. Apart from that, the NSL media used will encourage the development of mutual understanding between people, have a patient attitude because they have to wait their turn, and train responsiveness to problems manifested in each NSL plot. It is important for students because it can improve learning outcomes and eliminate boredom when learning numeracy.

The character of spiritual attitudes can also be interpreted in learning using NSL media. It was realized when the NSL dice were thrown. At this time, students will be full of hope in Almighty God. When the dice are thrown, we do not know what number will appear on the dice. Indirectly, this will teach that humans must be full of hope, in other words, full of prayer and optimism (Jannati & Hamandia, 2022). The sportsmanship in the game described above also develops into an attitude of responsibility. It means that whatever numbers appear must be accepted and resolved if there is a numeracy literacy problem. It is also the concept of trust, accepting decisions that have already happened.

Another attitude whose development can be observed is that students are trained to reduce ego and jealousy of other people's achievements (Puspitasari et al., 2021). The meaning of other people's achievements here is the achievement when a friend who is taking their turn throwing the dice then gets the number 6, so they are required to roll the dice again. Because everyone's achievements cannot be equal even though they have the same principle, namely reaching the finish box. Therefore, learning while playing using NSL media is a bridge to training mature and tough individuals.

Another attitude is honesty. Students must be honest Fadilah (2019) When it does not match the desired dice number, students must not cheat at all Auliyairrahmah *et al*. (2021), for example, by re-throwing for various reasons, or perhaps without the knowledge of his friends, acting in other ways of cheating. After

students roll the dice and stop on one of the NSL plots, students are required to solve and answer the existing problems. With a learning scheme like this, it is not uncommon for students to actively ask questions to solve the problems they encounter. The development of students' cognitive abilities can be seen in answering questions. Students can increase their numeracy intelligence by answering the questions on the NSL media paper board. The various types of questions available will improve your memory regarding formulas and calculating answers accurately. Mastery of the material will be maximized if students often experience direct practice (Karim & Wifroh, 2021).

However, the role of the teacher in guiding the student learning process must be underlined that intelligence is a manifestation of students' cognitive development, which is unique and different from each other. (Zefanya, 2018). It is shown in the results of problem-solving on the plot, where sometimes students answer problems incorrectly when solving problems.

In line with research, Afandi (2015) stated that media based on the Snakes and Ladders game increased learning outcomes by 45%. Something similar was stated by Salamah (2024) that learning media are snakes and ladders is an effective way to increase students' understanding and absorption in learning activities. It shows that the Snakes and Ladders Numeracy (NSL) learning media has an influence, and it is proven that the pretest and posttest results are met. There is a significant difference.

CONCLUSION

Based on the research results, NSL media is effectively used in elementary school students' learning. NSL media can make students actively involved in learning so that students' cognitive learning outcomes increase.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be constructed as a potential conflict of interest.