

The Effect of Snake and Ladder Media on Students' Understanding of Mathematical Concepts

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Abstract. The problem behind this research is the low ability to understand mathematical concepts of students at SD Negeri 1 Karangmangu, Kramatmulya District, Kuningan Regency. This is indicated by the number of students who have not reached the KKM. This study aims to determine the differences and increase in students' ability to understand mathematical concepts between students who use snakes and ladders media (experimental class) and classes that use picture media (control class). This research method uses a quasi-experimental design with non-equivalent control group design. The variable of this research is the variable X of the snake and ladder media and the variable Y is the understanding of mathematical concepts. The subjects in this study were the fifth grade students of SD Negeri 1. Karangmangu, totaling 26 students. The data collection in this study was a test in the form of an essay. The results showed that there were differences in students' understanding of mathematical concepts in the experimental class using snakes and ladders media and the control class using image media. And there is an increase (gain) understanding of students' mathematical concepts in the experimental class using snakes and ladders educational media and the control class using image learning media. This is shown from the results of hypothesis testing $T_{count} > T_{table}$. This shows that the snake and ladder media has an effect on students' understanding of mathematical concepts. The main suggestion is for teachers to use game-based media so that students are more motivated to learn mathematics. One of the media used is the snake and ladder media. The results showed that there were differences in students' understanding of mathematical concepts in the experimental class using snakes and ladders media and the control class using image media. And there is an increase in students' understanding of mathematical concepts in the experimental class using snakes and ladders education media and the control class using image learning media. This is shown from the results of hypothesis testing $T_{count} > T_{table}$. This shows that the snake and ladder media has an effect on students' understanding of mathematical concepts. The main suggestion is for teachers to use game-based media so that students are more motivated to learn mathematics. One of the media used is the snake and ladder media. The results showed that there were differences in students' understanding of mathematical concepts in the experimental class using snakes and ladders media and the control class using image media. And there is an increase (gain) understanding of students' mathematical concepts in the experimental class using snakes and ladders educational media and the control class using image learning media. This is shown from the results of hypothesis testing $T_{count} > T_{table}$. This shows that the snake and ladder media has an effect on students' understanding of mathematical concepts. The main suggestion is for teachers to use game-based media so that students are more motivated to learn mathematics. One of the media used is the snake and ladder media.

Keywords: Snakes and Ladders Media; Understanding of Mathematical Concepts; Mathematics

1 Introduction

Mathematics as one of the fields of study taught in formal educational institutions is an important part of efforts to improve the quality of education. Mathematics is a subject that deals with many concepts. Concepts in mathematics are related to one another. The interrelationships between one material concept and another are evidence of the importance of understanding mathematical concepts.

But in reality, it shows that students' understanding of concepts is still very low. This is because there are still many students' assumptions that are less positive about mathematics according to Achmad Gilang Fahrudin (Widari, 2013: 190). Understanding the concept is a very important part in learning mathematics, because with a mature understanding, students can solve a problem and are able to apply the learning to the real world. F.Widodo (2014) explains that concept understanding is the ability to understand abstract ideas and basic objects that students learn and associate relevant mathematical notations and symbols with mathematical ideas and then combine them into a series of logical reasoning. Based on cognitive learning theory, learning with understanding is more permanent and more likely to be transferred, compared to learning using formulas. The continuous learning process and student attitudes like this in learning mathematics have an impact on student learning outcomes.

Difficulties in mathematics tend to be the same, students find it difficult to remember and understand the teacher's explanations, so the teacher often repeats the explanation so that students who have difficulty learning mathematics can understand the material. Factors that influence the difficulty of learning mathematics shown by students with learning difficulties include low interest and motivation in learning mathematics. The low interest and motivation of students can be seen from students who think that mathematics is a difficult subject to learn. Students are also not active in participating in the mathematics learning process given by the teacher. Students often do not pay attention to the teacher when the teacher explains the material, draws, and is busy by himself. Another factor is the family that has not been optimally supported, which is characterized by not teaching or involving children in extra hours. The busyness of parents also results in a lack of attention and supervision from parents. In addition, the lack of mathematics learning media used by teachers makes it more difficult for students to learn mathematics. (Widya Officer, 2017).

The results of interviews that have been conducted in class V SD Negeri 1 Karangmangu that the main problem is that students lack understanding of students' concepts in solving problems given by the teacher, besides that the learning media used is less varied so that it affects student learning.

Table 1. Odd Semester Test Value Data Class V . Mathematics Subjects

Class	The number Of students	KKM <73	%	KKM >73	%
Group A	15	8	53%	7	47%

Group	11	6	54%	3	46%
B					

Based on the table above shows the low learning outcomes of fifth grade students at SD Negeri 1 Karangmangu 15 fifth grade students, 8 students or 53% have not reached the Minimum Completeness Criteria (KKM) and as many as 7 students or 47% have reached the Minimum Completeness Criteria (KKM). While at SD Negeri Cikaso, out of 11 students, 6 students or 54% of students have not reached the Minimum Completeness Criteria (KKM) and as many as 5 students or 46% have reached the Minimum Completeness Criteria (KKM).

The above is due to several factors, one of which is that students have difficulty understanding a concept that makes it difficult for students to understand the material and solve problems given by the teacher.

To overcome this problem, the researchers chose to use interactive and interesting learning media in the form of board games that were adapted to the material and needs of students. By using the media, students will more easily understand the concepts being studied, because learning involves physically and mentally with activities of seeing, touching, and manipulating teaching aids with the characteristics of elementary school students who have a strong curiosity and are interested in exploring the situation around them by using the media. feelings of pleasure and joy. As explained by Joni Purwono, et al (2014) mentioning that learning media has an important role in supporting the quality of the teaching and learning process, the media can also make lessons more interesting and fun.

One of the media used by researchers is snake ladder education media. Setiawan E, et al (Melsi, 2015: 10) Snakes and Ladders is a board game for children played by 2 or more people. The game board is divided into small squares and in some of the boxes are drawn a number of "ladders" or "snakes" that connect with other squares.

Snakes and ladders educational media is expected to be useful to help improve students' understanding of concepts. Snakes and ladders game products are able to actively involve at least the senses of sight and hearing and explore the cognitive and competence side of children, namely through text, images and sounds so that they attract children's attention to continue the game. (Syumarlin, 2013).

The purpose of this game of snakes and ladders is to provide learning motivation to students so that they always study or repeat the material that has been previously studied which will later be tested through games so that it feels fun for students.

With snake and ladder educational media students can play while learning, besides that it can stimulate the development of students' thinking power, and students are trained to learn to work together with their friends.

So it is hoped that the use of snakes and ladders media can help students in solving problems in identifying building material.

Snakes and ladders game is a game that is liked by elementary school students. Learning mathematics with snakes and ladders games can motivate students to continue learning to develop their abilities by actively involving students in learning, and also with snakes and ladders games students are able to understand the concepts of mathematics well. Learning by playing can provide opportunities for students to explore, find out for themselves, practice and get countless various concepts and understandings, this is where the learning process occurs, the teacher is not only limited to transferring knowledge but also guiding students to be skilled in finding knowledge concepts with their own experience. through an inspiring and fun learning atmosphere.

As stated by the results of research conducted by Rahina (2017) which states that learning media in the form of a snake and ladder game is an effective medium to increase students'

absorption and understanding. Then also the results of a study conducted by Putri ZF, (2017) which states that learning mathematics with the snake and ladder game media can motivate students to continue learning to develop their abilities by actively involving students in learning.

2 Research Methods

The type of experimental research method used is quasi-experimental or quasi-experimental which is an experimental method that does not allow researchers to fully control the variables and experimental conditions. According to Sugiyono (2017: 114) Quasi Experimental research can be interpreted as a research method used to find the effect of certain treatments on others in uncontrolled conditions (as is).

The research design used in this study is the experimental design "Non-equivalent control group (comparison group/pretest-posttest) design". The pretest aims to determine the students' initial ability to understand mathematical concepts, while the posttest aims to determine the level of understanding of students' mathematical concepts after using snake and ladder educational media. The research design can be described as follows:

Table 2. Research design Non Equivalent Control Group Design

Group	Pre-Test	Treatment	Post-Test
A	O1	X1	O3
B	O2		O4

2.1. Place and Time of Research

This research was conducted at SD Negeri 1 Karangmangu which is located at Jalan Karangmangu Village, Kramatmulya District, Kuningan Regency, even semester, April 2020/2021 academic year with the material of building space. The time and research activities can be seen in the table below:

2.2. Research Subject

This research was conducted at SD Negeri 1 Karangmangu, Kramatmulya District, Kuningan Regency. The subjects to be studied were all fifth grade students of SD Negeri 1

Karangmangu as group A and class V of SD Negeri Cikaso as group B. For group A at SD Negeri 1 Karangmangu and Group B at SD Negeri Cikaso. In this study, no sampling technique was used because the sample studied was the entirety of the existing population or called a census. Because the total population is only 26 students from 2 classes. Group A amounted to 15 students who received treatment using snake ladder educational media as an experimental class, and group B totaling 11 students did not use snake ladder education media as a control class.

2.3. Research Variable

Research variable is an attribute, nature or value of people, objects or activities that have certain variations that are determined by researchers to be studied and then conclusions are drawn. This study consisted of one independent variable (Independent Variable) namely the snake and ladder educational game and one dependent variable (Dependent Variable) namely students' understanding of mathematical concepts (Y).

2.4. Data Collection Technique

According to Arikunto (2015: 56) the test is to suggest that the test is a tool or procedure used to find out or measure something in learning, with the methods and rules that have been determined. The test aims to determine the extent of students' abilities in the initial test or before treatment, as well as to determine the ability of students after treatment. The test technique used in this research is a description test of 20 questions that can be used to measure students' understanding of mathematical concepts. The test in this study was conducted twice, namely: pretest and posttest.

1. *Pretestis* a test that is given before giving treatment. The pretest was carried out with the aim of knowing the initial abilities possessed by students before being given treatment. The data obtained from this pretest is data on the initial ability to understand mathematical concepts before using snakes and ladders educational media.
2. *Posttest* This is a test that is given after the end of the treatment. The posttest aims to determine the students' understanding of mathematical concepts after using the snake and ladder educational media.

3 Research Result

3.1. Description of Initial Ability (Pretest)

The pretest (initial test) was carried out at the beginning of learning which was used as a measuring tool to know the understanding of the concept of fifth grade students at SD Negeri

1. Karangmangu. This is done to see students' understanding before the learning process by using snake and ladder media. From the results of the pretest (initial test) the experimental class and the control class obtained the following data:

Table 3. Pretest Experiment Class and Control Class

Class	N	Total value	Min Value	Max Value	Average	Standard Deviation
Experiment	15	504	25	40	33.6	4.33
Control	11	383	30	40	34.81	3.91

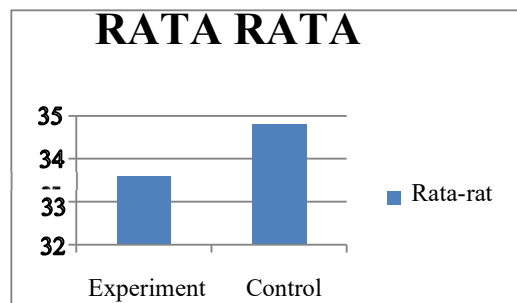


Figure 1. Pretest Results of Experimental Class and Control Class

3.2. Final Ability Description (Posttest)

After the learning process was carried out in the experimental class using snakes and ladders media and the control class with picture media, a final test (Posttest) was carried out to determine whether there was an effect of the treatment given on the students' conceptual understanding. From the posttest results for the experimental class and the control class, the following data were obtained:

Table 4. Experiment Class Posttest and Control Class

Class	N	Total value	Min Value	Max Value	Average	Standard Deviation
Experiment	15	1053	62	83	70.2	7.29
Control	11	504	40	52	45.82	4.95

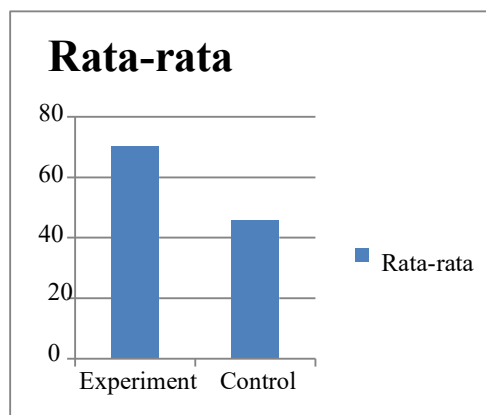


Figure 2. Posttest Results of Experiment Class and Control Class

3.3. Description of Gain

The calculation of the gain test was carried out to determine the increase in students' conceptual understanding by using snake and ladder media in the experimental class and

drawing media in the control class. The following table contains a description of the gain of the experimental class and the control class:

Table 5. Gain of Experiment Class and Control Class

Class	Pretest	Posttest	N-gain	Criteria
Experiment	33.6	70.2	0.55	Currently
Control	34.81	45.82	0.17	Low

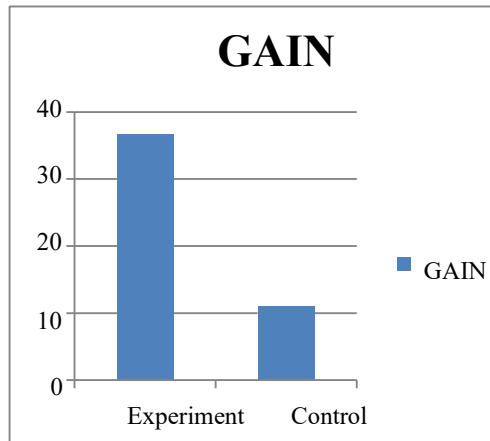


Figure 3. Experiment Class and Control Class Gain Results

3.4. Research Result Data Analysis

This research was conducted at SD Negeri 1 Karangmangu, Kuningan District, Kuningan Regency. This research was conducted by conducting the learning process in two classes, namely group A and group B. Group A was an experimental class that was treated with snakes and ladders media and group B was a class that was treated with image media. After getting the results of the pre-test (initial test) and post-test (final test) from the experimental class and the control class. Furthermore, data analysis is carried out with the following steps: Normality test

The normality test for the distribution of the experimental class and control class data is calculated using the Chi-Square test which is presented in table 6 below:

Table 6. Pretest and Posttest Data Normality Test Results

Statistics	Experiment		Control	
	Pretest	Posttest	Pretest	Posttest
Average	33.6	70.2	34.81	45.82
elementary school	4.33	7.29	3.91	4.95
X ² count	4,853	4,403	1,821	5,441
X ² table	5,991			

Based on the results of the normality test calculation, it is known that $X^2_{count} < X^2_{table}$ $\alpha = 0.05$. This means that the pretest and posttest data in the experimental class and control class are normally distributed.

3.5. Homogeneity Test (F Test)

Homogeneity test was conducted to determine whether the data obtained from the two groups had homogeneous variance or not. The results of the homogeneity test of the pretest and posttest of the two groups can be seen in table 7.

Table 7. Results of Homogeneity Test of Pretest and Posttest Data

Statistics	Pretest		Posttest	
	Experiment	Control	Experiment	Control
variance	18.75	15.29	52.14	24.30
Fcount	1.23		2.19	
Ftable	4.26		4.26	
n1	11		11	
n2	15		15	
Ket	HOMOGENEOUS		HOMOGENEOUS	

Based on the results of the calculation of the homogeneity test using the F test, it is obtained that $F_{count} < F_{table}$. From the calculation results, it is obtained that the pretest Fcount is 1.23, while the Fcount Posttest is 2.19. This means that $F_{count} < F_{table}$ means the value of the experimental class and control class is homogeneous.

3.6. Hypothesis testing

T-Test Final Test (Posttest) Experiment Class and Control Class

Table 8. Hypothesis Test Results Final Test (Posttest)

Class	The number of students	Average	variance	tcount	ttable	Note.
Experiment	15	71.67	53.09	14.01	1.71	H0 rejected
Control	11	45.64	24.54			

From the calculation results obtained $t_{count} = 14.01$ while $\alpha = 0.05$ and $db = 24$, obtained $t_{table} = t_{0.05(24)} = 1.71$, so $t_{count} (14.01) > t_{table} (1.71)$ and it can be said that H_0 is rejected. It can be concluded that there are differences in students' understanding of concepts between students who get snakes and ladders media and students who get picture media4

4 Discussion

This study started from giving pretest questions to the experimental class and the control class. The results of the initial ability test for the experimental class were obtained with a total score of 504 with an average value of 33.6 with the lowest score of 25 and the highest score of 40. While the test results initial ability for the control class with a total of 383 with an average score of 34.81 with the lowest score of 30 and the highest score of 40.

After giving the pretest questions, then giving treatment or material to the experimental and control classes, giving this treatment 3 times in meetings for the two classes. Furthermore, the researcher gave a final ability test (posttest) to the experimental class and control class, for the experimental class a total score of 1053 was obtained with an average value of 70.2 with the lowest score of 60 and the highest score of 83. While the results of the final ability test of the control class obtained a total score of 504 with an average score of 45.82 with the lowest score of 40 and the highest score of 52.

From these data, normality test was carried out in the experimental class and the control class. For the results of the initial ability test (pretest) of 4.853 and 4.403. This value is smaller than the χ^2 table at $\alpha = 0.05$ which is 5.991 so it can be said that the pretest data in the two research groups are normally distributed. While the results of the final ability test (posttest) were 1.821 and 5.441. This value is smaller than the value of χ^2 table at $\alpha = 0.05$, which is 5.991 so it can be said that the final ability test data (posttest) in the two research groups is normally distributed.

Furthermore, the results of the homogeneity test for the initial ability test (pretest) obtained the results of Fcount of 1.23 while Ftable= 4.26. Based on this, it can be said that the pretest value data in the experimental class and control class are homogeneous because the results of Fcount (1,23)<Ftable (4,26). While the results of the homogeneity test for the final ability test (posttest) obtained the results of Fcount of 2.19 while Ftable= 4.26. Based on this, it can be said that the posttest value data in the experimental class and control class are homogeneous because the results of Fcount (2.19) < Ftable (4,26).

Based on the results obtained, the average value is not much different between the experimental class and the control class, which has normal distributed data and homogeneous data. This shows the average value of the final ability (posttest) between the experimental class and the control class, learning using snakes and ladders media further improves students' understanding of mathematical concepts.

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Based on the results obtained, the average value is not much different between the experimental class and the control class, which has normal distributed data and homogeneous data. This shows the average value of the final ability (posttest) between the experimental class and the control class, learning using snakes and ladders media further improves students' understanding of mathematical concepts.

Then the researcher continued with hypothesis testing, the first hypothesis testing was to answer the hypothesis whether there were differences in students' understanding of mathematical concepts between those who used snakes and ladders media and students who used picture media. The results of hypothesis analysis using the t-test in the final test obtained the results $t_{count} (14.01) > t_{table} (1.71)$, so it can be concluded that there is a difference between the level of understanding of students' mathematical concepts (posttest) in the experimental class using snake and ladder media and control class that uses image media.

This can happen because students in the experimental class are given treatment with the application of snake and ladder media so that they are more enthusiastic and enthusiastic in learning. In addition, students can play while learning and they are trained to learn to work together with their friends so that students are more active in learning. This snake and ladder game helps students to remember what they have learned before so they can understand and understand better. As stated by Nachiappan (2014) there are several functions of the game of snakes and ladders, snakes and ladders can be a tool to build interactive communication between players. In addition, snakes and ladders can be filled with a variety of educational and entertaining materials.

This statement is reinforced by the results of a study conducted by Putri ZF, (2017) which states that learning mathematics with the snake and ladder game media can motivate students to continue learning to develop their abilities by actively involving students in learning. Teachers are not only limited to transferring knowledge but also guiding students to be skilled in finding counting concepts with their own experience.

Furthermore, in the submission of the second hypothesis, namely knowing the difference in increasing students' understanding of mathematical concepts, both from the experimental class and the control class. The experimental class uses snakes and ladders media while the control class uses image media, to calculate the difference in the increase using the t-test the results obtained are $t_{count} (3.8) > t_{table} (1.71)$, thus there are differences in the increase in students' understanding of mathematical concepts using snake and ladder media using image media, so that the snake and ladder model is more effectively used in improving students' understanding of mathematical concepts.

Differences in improving learning outcomes can occur because the use of game-based learning media can make the learning process more enjoyable, through playing activities while learning students can also gain the ability to understand learning material scientifically without coercion. In addition to having the potential for learning and entertainment, snake and ladder learning media can also encourage interaction between others, so that it will make students more involved in their learning process. The snake and ladder game strategy as described by Said and Andin Budimanjaya (2015) is a type of attractive game that involves children playing an active role in snakes and ladders. The strong interaction pattern of students' activities when playing the game of snakes and ladders in learning activities causes this game to be very liked by students.

The results of this study are in line with previous research conducted by Sunarti, Amril M, Rian Vebrianto (2020) with the research title: "Development of Science Learning Media Snakes and Ladders to Support Understanding Science Learning Concepts in Elementary Schools". The results of the research can be concluded that the snake and ladder science learning media can improve students' understanding of learning concepts.

In this study, it was proven that the snake and ladder media can improve students' understanding of mathematical concepts. However, the research process does not always run smoothly, in the research process researchers find obstacles or problems faced, namely in making learning media an attractive design is needed so that in this case the creativity of

researchers is needed. In addition, the learning process using snake and ladder media requires a lot of time while the time provided by the school is very limited.

5 Conclusions And Suggestions Conclusion

The learning activities for class V Mathematics subject matter using snakes and ladders media at SDN 1 Karangmangu even semester 2020/2021 were successfully carried out and the results were satisfactory in increasing students' understanding of concepts. Based on the results of data analysis that has been carried out, the authors can draw the following conclusions:

1. There are differences in students' understanding of mathematical concepts in the experimental class using snake and ladder media and the control class using image learning media.
2. There is an increase in students' understanding of mathematical concepts in the experimental class using snake and ladder media and the control class using image learning media.

Based on the results of the discussion, it can be concluded that using the snake and ladder media can have an influence on students' understanding of mathematical concepts.

6 Suggestion

The teacher in using the snake and ladder media teacher can set the steps and rules in playing the snake and ladder well. It is intended that the game of snakes and ladders can run well so that students are able to work independently and increase their knowledge. Furthermore, so that the game runs smoothly, the teacher also needs to make sure that the students have really mastered the rules of the game before the game starts. For further researchers, the use of snakes and ladders media can be developed in various other relevant learning materials as well as into the realm of other learning outcomes. If other researchers want to do the same, researchers can develop this snake and ladder learning media with different rules and designs or adapted to the material to be given.

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