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THE EFFECT OF ENGKLEK GAME MODIFICATION ON STUDENTS' ABILITY TO UNDERSTAND GRADIENT MATERIAL

AN ANALYSIS OF MODIFICATIONS TO THE HOPSCOTCH GAME ON STUDENTS' ABILITY TO UNDERSTAND GRADIENT MATERIAL

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Abstract

Mathematics is one of the basic knowledge that has an important role in the means of thinking to develop logical, systematic and critical thinking. In mathematics, it has many connections with abstract ideas which are given symbols that are arranged hierarchically, so learning mathematics takes a long time and requires patience, one of which is understanding gradient material. Gradient or slope is a number that states the degree of slope of a line, the more sloping a line is, the greater the gradient. In general, students experience difficulties in learning gradient material due to several factors. One of the factors that makes it difficult for students to understand gradient material is their low understanding of the material, unable to understand the concept of the material, and lack of practice in working on the questions. In overcoming the difficulties in understanding the gradient material above, teachers need to provide interesting learning methods for students. The existence of learning using a modified engklek game makes it easy for students to understand, not get bored quickly and feel entertained by this learning method. Apart from that, in this engklek game method students can think relatively freely and be more active in communicating. The population of this research is class X MAN 2 Jember 2022 students, totaling 1 class X Science 5.

Key words: Cranks, Gradients, Lines

INTRODUCTION

1.1 Background

Mathematics is a thought or science that uses a formula to find an analysis of an object. Mathematical scientists who influence civilization make it easier for humans to implement everyday life. Muhammad Al Khawarizmi was the first person to discover the mathematical sciences of structure and arithmetic so he was named the "Father of Mathematics". Mathematics makes it easier for people in everyday life, namely 1) Solving financial problems, 2) As a means of development to become systematic, 3) And supports various jobs.

Mathematics is considered a difficult subject. The majority of students experience difficulties in mathematical operations, including difficulty distinguishing between symbols and algebra, inability to think abstractly, and difficulty understanding mathematical formulas. Lack of memory is also quite hampering students in applying problem operations. One of the mathematical materials is gradient.

Gradient is a value of inclination or slant of a line to determine the distance of the slope in the ratio shown in the form of direction, whether up, down, vertical or horizontal. The benefits of studying gradients include measuring the inclination of a slope in several places, solving problems in everyday life such as time and distance at a speed, determining a price at a certain time, and so on. In general, students experience difficulties in learning gradient material because, 1) Students find

formulas for the properties of gradients, 2) Negative number operations, 3) Determine points in Cartesian coordinates, 4) It is difficult to determine the slope if one parallel line is known, 5) Finding the gradient if one perpendicular line is known and 6) The teacher's presentation is monotonous.

Researchers provide solutions to overcome these students' difficulties using the method of students' ability to understand gradient material through the medium of the engklek game. Engklek is a game that is generally popular with children, especially girls. These traditional games require a flat area such as the ground as a playing area. The game is modified so that it can be implemented as a learning medium. In the modification of the traditional engklek game, each team consists of two people, with one person playing engklek and one person in charge of placing the flag to ask the opponent questions regarding the gradient material. The winning team is the team that reaches the opponent's *starting point.* This research was conducted at MAN 2 Jember with a population of 37 students and a sample of 10 students.

1.2 Formulation of the problem

How to implement the crank game modification on gradient material?

1.3 Objective

Motivation to learn in the engklek game influences the understanding of gradient material, students are expected to be able to understand a gradient from these modifications. Understanding students' difficulties in solving gradient problems, it is hoped that students will be more interested in learning. Review students to undergo learning innovations that are not monotonous.

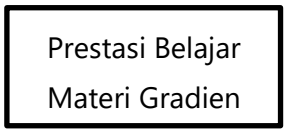
1.4 Benefit

1) Make it easier for students to understand gradient material

2) Preserving the engklek game as a local cultural value

3) Helps solve problems related to gradient properties

4) Increase students' motivation in learning through engklek media.



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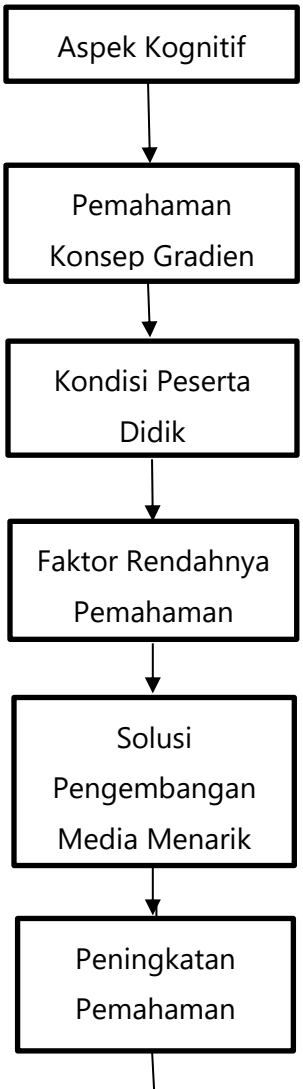
RESEARCH METHODS

2.1 FRAMEWORK OF THINKING



To find out the influence of the engklek game media on understanding gradient material.

2.2 RESEARCH DESIGN

This research design is a research plan for conveying data. This research is classified as quantitative research where research data is presented in the form of numbers. This research is also included in *quasi experimental design research* . This research analyzes the influence of comic media on student learning achievement in the gradient sub-subject. Researchers divided ten students into a control group and an

experimental group. The control group is a group that does not use engklek game media in studying gradients, while the experimental class uses engklek media in studying gradient material. In obtaining data, researchers conducted *a pre-test* and *post-test* .

2.3 P OPULATION

Population is an area of abstraction that includes objects or subjects whose criteria or characteristics will be studied for drawing conclusions (Sugiono, 2015). "Population is defined as all research objects that have certain characteristics" (Margono, 2017) . Population can be objects or people. The population in this study was class X Science 5 Madrasah Aliyah Negeri 2 Jember with a total of 37 students.

2.4 RESEARCH SAMPLE

Research samples were used to collect data. The accuracy of the data can be seen from the research sample. Samples are taken from the population, so the sample is defined as part of the population (Sugiono, 2015) . "Samples are part of the number and criteria in a population" (Deni, 2016) . In conducting research, researchers do not need to collect data on the entire population, but can collect data on samples from that population.

Determining the number of studies is based on the following guidelines, "If the population is more than 1,000 then the sample used is 10% of the population. "If the population size is ± 100, then the sample used is at least 30% of the population, and if the population size is less than or equal to 30 then the sample must be 100%" (Deni, 2016). Based on these guidelines, because the population is 37, a 27% sample will be taken, namely 10 students. These students will be divided into 2 groups, namely 5 students for the control class and 5 students for the experimental class.

2.5 PLACE AND TIME OF RESEARCH

1. Research location

This research will be carried out at Madrasah Aliyah Negeri 2 Jember. Especially for class Patrang, Jember Regency, East Java 68117.

2. Research time

This research was carried out over a period of approximately three months and three weeks to be precise on February 2 2022-Completed. This research was conducted on an effective learning day.

2.6 MEDIA MANUFACTURING TOOLS AND MATERIALS

No	Tools and materials	Unit price	Quantity	Amount
1	Manila Paper	IDR 5,000	**6**	IDR 30,000
2	Black Duct Tape	Rp . 12.000	**3**	Rp . 36,000
3	Black Marker	IDR 6,000	**1**	Rp . 6.000
4	Hype Pencil 2B	Rp . 3,000	**1**	Rp . 3,000
5	Cardboard	Rp . 6,000	**1**	Rp . 6,000
6	Fountain pen	IDR 2,000	**2**	Rp . 4,000
7	Eraser	Rp. 2,000	**1**	Rp . 2,000
8	Flag	Rp . 15,000	**2**	IDR 30,000
	Total			Rp. 117.000

2.7 DEFINITION OF VARIABLES

In this research there are two independent variables and two dependent variables. The operational definition of variables in this research is as follows:

a. Independent variable

According to (Sugiyono, 2018) the independent variable is a variable that influences the dependent variable. The independent variable in this

research is the use of engklek media (X_1)and without using engklek media (X_2).

2Dependent variable

According to (Winarno, 2013) the dependent variable is the response or output variable that arises as a result of the independent variable. The dependent variables in this research are *pre-test* (Y_1)and *post-test*(Y_2)

		Prepare pre-test and post-test questions	Prepare pre-test and post-test questions
Implementation		Introduce myself	Introduce myself
		Checking the presence of research subjects	Checking the presence of research subjects
		Do a pre-test	Do a pre-test
		Delivering material using the lecture method	Delivering material using engklek media
		Carrying out post tests	Carrying out post tests

2.8 TEACHING SCENARIOS

This research uses the traditional engklek game as media. The learning method in the control class is without using media or using the lecture method. The learning method in the experimental class is using the engklek game as a learning medium. The detailed teaching scenario is presented in Table 3.1 as follows.

Table 3.1 Teaching Scenarios

Stage	Control Class	Experimental Class
Preparation	Prepare materials	Prepare materials

The pre-test and post-test questions consist of 20 multiple choice questions with points for each question being 5 for correct answers and 0 for wrong or blank answers.

2.9 A DATA ANALYSIS

Data analysis techniques are an attempt to process data into new information. Data analysis is needed so that the data criteria are easy to understand in order to solve research problems . In this research, the data includes quantitative research where numerical data can be calculated accurately, quantitative data generally

uses calculation and statistical models.

The data assessed in the independent variable of this research is the influence of engklek media . Meanwhile, the dependent variable in this research is the result of somatotype *on* student achievement . This research data needs to be taken in the form of accurate numbers because this type of research is quantitative. In this research, researchers used *paired* t-test analysis using SPSS software as a tool during the research. There are a number of test requirements first to determine the suitability of the data carried out, the following are the test requirements.

2.9.1 Normality Test

The normality test aims to provide certainty that the data obtained is normally or not normally distributed. The normality test used in this research is the *Kolmogorof-Smirnov* test method with the help of SPSS 24 *for Windows* with a significance of 0.05. If sig > 0.05 the data is normally distributed, conversely if sig < 0.05 the data is not normally distributed.

2.9.2 Homogeneity Test

The homogeneity test aims to ensure that the sample group has the same homogeneous variance or not. To calculate the prerequisite tests, data analysis with a homogeneity test was carried out using SPSS 24 *for Windows* using *Levene's Test* . The characteristic provisions are as follows: If the sig value is > 0.05 then the data has homogeneous variance. If the sig value <0.05 then the data has non-homogeneous variance.

2.9.3 Hypothesis Testing

Data analysis used to test the hypothesis in this research was the *paired* sample t-test using the SPSS 24 *for Windows program* . Provided that if the value is sig < 0.05 then Ha is accepted and Ho is rejected, whereas if sig > 0.05 then Ha is rejected and Ho is accepted.

DISCUSSION

3.1 Research Results

This research was carried out in class XI IPA 5 Madrasah Aliyah Negeri 2 Jember as the

research site, with a population of 37 students and a research sample of 10 students. The research sample was used for the correlation test. The reason that made the researcher consider choosing class Another consideration for researchers conducting research in class

The data presented in this research was obtained using the correlation method with pre-test and post-test techniques. The variables in this research are the use of engklek media (X_1)and without using engklek media (X_2). Variables X $_1$ and X $_2$ are independent variables. The dependent variables are *pre-test* (Y_1)and *post-test* (Y_2). To find out the data presentation for each variable in detail, see the following description.

1. Use of Traditional Engklek Game Media

Results data regarding learning outcomes using engklek media at Madrasah Aliyah Negeri 2 Jember were obtained by conducting *a pre-test* and *post-test* . Each student is given questions to work on before learning, which is called a pre-test. Next, students are given exposure to material regarding gradients using the engklek game as media. After students were given exposure to the material, the researcher conducted a post test on the students. The results of the pre test and post test on the use of the engklek game media can be seen in Table 4.1 as follows.

Table 4.1 Pre Test and Post Test Results for Using Engklek Media

Name	Pre-test	Post test
Kelvian	40	75
Halwa	30	80
Falzah	25	70
Sofia	35	85
Indi	40	80

Based on Table 4.1, it is found that the size of the distribution and concentration of data in the pre test with the highest score is 40, the lowest score is 25, the mean is 34, the median is 35 and the mode is 40. The size of the distribution and concentration of data in the post test is with the highest score being 85, the lowest score being 70, the mean being

78 , the median is 80 and the mode is 80. Based on Table 4.1, this can be depicted in a bar diagram as follows.

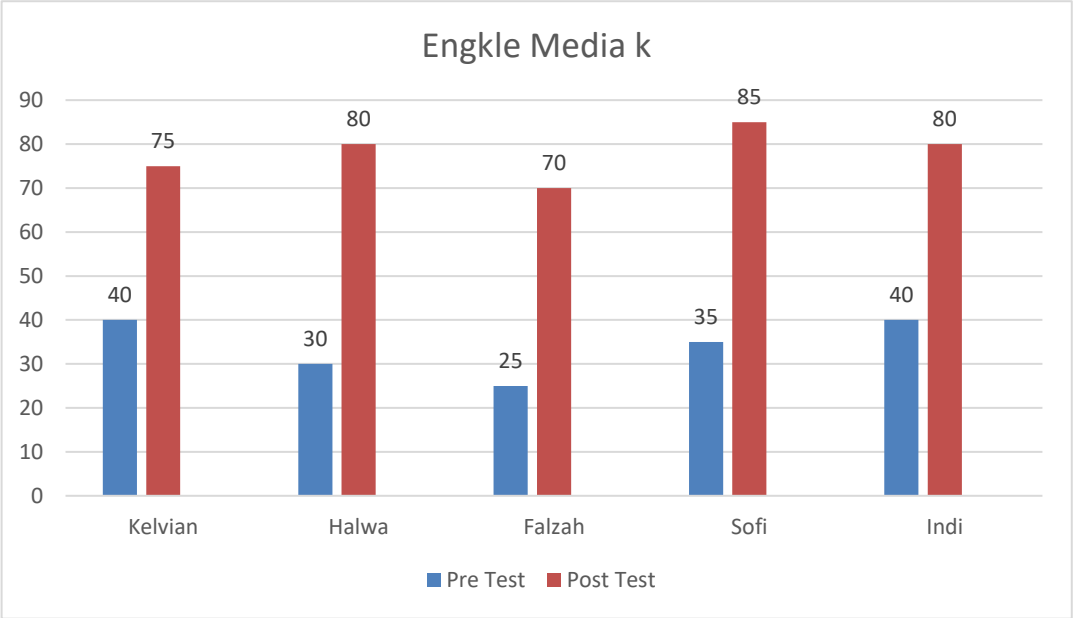


Figure 4.1 Bar Diagram of Engklek Media Use

2. Without Using Engklek Media

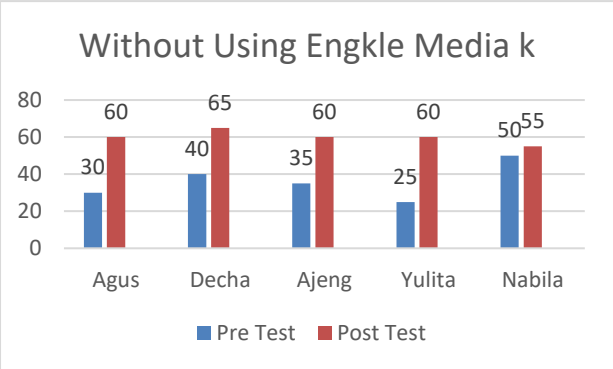
Results data regarding learning outcomes without the use of engklek media at Madrasah Aliyah Negeri 2 Jember were obtained by conducting *a pre-test* and *post-test* . Each student is given questions to work on before learning, which is called a pre-test. Next, students are given exposure to material regarding flat shapes using the lecture method. After students were given exposure to the material, the researcher conducted a post test on the students. The results of the pre-test and post-test without using the traditional engklek game media can be seen in Table 4.2 as follows.

Table 4.2 Pre Test and Post Test Results without Using Engklek Media

Name	Pre-test	Post test
Agus	30	60
Decha	40	65
Ajeng	35	60
Yulita	25	60
Nabila	50	55

Based on Table 4.2, it is found that the size of the distribution and concentration of data in the pre test with the highest score is 50, the lowest score is 25, the mean is 36, and the

median is 35. The size of the distribution and concentration of data in the post test is with the highest score being 65, the lowest score being 55,



Results Without Using Engklek Media

3.1.1 Data Analysis

The research data was then analyzed using the t-test to see the effect of gradient media on student learning achievement. Before carrying out a hypothesis test, there are several tests that must be passed, namely the normality test and homogeneity test.

1. Research Data Normality Test

The normality test is a procedure or step that is used to determine whether the distribution of data is normal or abnormal. The normal distribution is a symmetric distribution with the mode, mean and median in the center. The normality test used in this research is the *Kolmogorov-Smirnov method.* The indicator for determining a decision in looking at normally or abnormally distributed research data is that if the significance level or probability value is > 0.05, then the research data is normally distributed. If the significance level or probability value is <0.05, then the research data is not normally distributed. A good regression model is if the data has residual values that are normally distributed. The normality test in the experimental class and control class is presented in Table 4.3 as follows.

Table 4.3 Normality Test in the Experimental Class and Control Class

Student learning outcomes	Kolmogorov Smirnov		
	Statistics	df	Sig
Pre Test Experiment	0.221	5	0.200
Post Test Experiment	0.237	5	0.200
Pre Test Control	0.141	5	0.200
Post Control Test	0.300	5	0.161

Based on Table 4.3, the results of the normality test in the experimental class and control class using *Kolmogorov-Smirnov* are concluded as follows.

a. The level of significance in the experimental class pre-test $0{,}200 > 0{,}05$means it can be concluded that the data is normally distributed.

b. The level of significance in the experimental class post test $0{,}200 > 0{,}05$means that it can be concluded that the data is normally distributed.

c. The level of significance in the control class pre-test $0{,}200 > 0{,}05$means it can be concluded that the data is normally distributed.

d. The level of significance in the control class post test $0{,}161 > 0{,}05$means that it can be concluded that the data is normally distributed.

2. Research Data Homogeneity Test

The Homogeneous Test is a test of data which aims to determine whether the data population has the same variance value, in other words the data comes from the same population. The homogeneity test was carried out in this research using the Levenne test method . If the significance level or probability value is > 0.05, then the data comes from populations that have the same variance or are homogeneous. If the significance level or probability value is <0.05, then the data comes from populations that have unequal variances. The homogeneity test in the experimental class and control class is presented in Table 4.4 as follows.

Table 4. 4 Homogeneity Tests in the Experimental and Control Classes

		Levene Statistics	df1	df2	Sig.
Student learning outcomes	Based on Mean	1,773	3	16	0.193
	Based on Median	1,238	3	16	0.329
	Based on Median and with adjusted df	1,238	3	12,444	0.337

Based on trimmed mean	1,708	3	16	0,206

Based on Table 4.4, it is found that at the significance level or probability value of the data $0{,}193 > 0{,}05$,, it can be concluded that the data is homogeneous or comes from populations that have the same variance.

3. Hypothesis testing

Data analysis was used to test the hypothesis in this study using the *paired* sample t test using the SPSS 24 *for Windows program* . Provided that if the value is sig < 0.05 then Ha is accepted and Ho is rejected, whereas if sig > 0.05 then Ha is rejected and Ho is accepted. The hypothesis of this research is as follows.

Ho: there is no significant difference between using engklek media and without using engklek media.

Ha: there is a significant difference between using engklek media and without using engklek media.

Hypothesis testing on hand grip strength is presented in Table 4.5 as follows.

Table 4.5 Hypothesis Testing on Hand Grip Strength

Based on data 4.5, it is found that the sig(2-tailed) value $0.000 < 0.05$,means Ha is accepted and Ho is rejected or it can be concluded that there is a significant difference between the use of engklek game media and without using engklek game media.

3.2 DISCUSSION

This research aims to determine the difference between using the engklek game media and without using the engklek game media in studying gradient material. Based on data analysis, it was found that there was a difference in the use of crank game media and without using crank game media in studying gradient material. Using the engklek game media is also more effective than without using the

engklek game media. This can be seen from the class average of students' post test results in the experimental class being better than those in the control class.

The use of engklek game media can make students more interested in learning, especially with the game board and the concept of a game like snakes and ladders which students really like. Students will not get bored because they think they are playing, even though they are actually learning gradient material. This will also increase students' concentration levels in learning gradient material by reading the graphs occupied by their team.

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