

## The Effect of Discovery Learning Model to Students' Mathematical Concept Mastery

Hotmika Sihombing<sup>1</sup>, Bornok Sinaga<sup>2</sup>, Mukhtar<sup>3</sup>

<sup>1</sup>(Mathematic Education of Postgraduate School, State University Of Medan, Indonesia)

<sup>2</sup>(Mathematic Education of Postgraduate School, State University Of Medan, Indonesia)

<sup>3</sup>(Mathematic Education of postgraduate School, State University Of Medan, Indonesia)

Corresponding Author: Hotmika Sihombing

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**Abstract:** This study aims to determine the effect of the discovery learning model to students' mathematical concepts mastery seventh grade students of SMP Negeri 5 Siborongborong academic year 2013/2014. Based on a sample population and  $L_0 < L_{table}$  and the students' mathematical concepts mastery  $L_0 < L_{table}$  at a significance level of 5% with  $N = 30$ , so that it can be concluded that the data were normally distributed. Results of regression linearity test obtained  $F_{count} = 1.29$  and  $F_{table} = 2.55$  with  $dk (k-2) = 6$ , so that  $F_{count} < F_{table}$ , so that there is a linear relationship between the shape of the discovery learning model to students' mathematical concepts mastery at a significance level of 5%. The results showed that there are significant correlation linear and mean time between discovery learning model to students' mathematical concepts mastery, with correlation coefficient  $r_{xy}$  at 0.4442. The coefficient of determination  $r^2$  of 0.2. From these data indicated that there is positive and significant between discovery learning model to students' mathematical concepts mastery seventh grade students of SMP Negeri 5 Siborongborong.

**Keywords :** Discovery learning model, students' mathematical concept mastery, triangle.

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### I. Introduction

Education is a lifelong requirement, every human being needs education until whenever and wherever they are. Therefore, education is very important, because without education all people will be difficult to develop and even he was retarded. Thus, education should really be directed to produce quality human and able to compete, besides having noble character and morals. Mathematics as one of the basic sciences are studied from primary school to universities are expected to cultivate the abilities and personal form students. This shows that math is important to learn. As suggested by Cornelius (in Abdurahman, 2003: 253) that:

Five reasons for the need to learn math because math is (1) a means to think clearly and logically, (2) proposition to solve the problems of everyday life, (3) the proposition recognize the relationship patterns and generalization of experience, (4) the means to develop creativity and (5) a means to increase awareness of cultural development.

But the main problem that many faces today is the lack of mathematics achievement. The low achievement reflects the students' mathematics learning that students have difficulties in learning mathematics in the understanding of mathematical concepts and their application as well as in solving problems, so that the results achieved are low. Students' understanding of mathematical concepts is low, they can not use it to solve the problem, especially when the matter is a little complex. The Problem of the low ability of students to learn mathematics is due to lack of skill in mathematical reasoning and the inability of students to analyze or understand the problems that exist in the matter.

These conditions indicate the learning objectives mathematically in Indonesia has not been achieved optimally, as disclosed (DEPDIKNAS: 2006) regarding Permendiknas 22 of 2006 (contents) that mathematics learning aims to make the students have the ability to think logically, analytical, systematic, critical, and creative, as well as the ability to work together in learning mathematical concepts. The ability of understanding of the concept is the ability to be owned by the students so that the students can solve a mathematical problem. Wardhani (2008: 21) in (Asih, 2014: 1) says that for students to solve a problem it is necessary to better understand the mathematical concepts first.

Talking about the results of learning mathematics, it can not be separated from the components that determine the success of learning itself, one of which is the education manager itself or the teacher. Teachers have a great responsibility towards improving the quality of education. Teachers are a key role in the development of individual quality to the citizens who understand science and technology. No matter how good

the facilities and infrastructure, there will be no sense if teachers are not able to organize all the learning resources into meaningful things. But in practice, teachers are still too passive (monotonous) in presenting the material in class. Teachers assume that learning is done correct and effective. Teachers are accustomed to simply be passive with the state will be difficult to create a dynamic learning. The result will be very far from success in order to achieve the learning objectives has affected even the failure to achieve educational goals. By knowing the difficulties experienced by the students and the causes can be designed learning alternatives that might be responsible, or at least reduce the difficulties these students, so that effective learning and objectives have been achieved. Once you know the error can be traced layout difficulty and a contributing factor. To further sought an alternative to learning to overcome, or at least reduce the difficulties students. The result will be very much of a success in order to achieve the learning objectives has affected even the failure to achieve educational goals. By knowing the difficulties experienced by the students and the causes can be designed learning alternatives that might be responsible, or at least reduce the difficulties these students, so that effective learning and objectives have been achieved. Once you know the error can be traced layout difficulty and a contributing factor. To further sought an alternative to learning to overcome, or at least reduce the difficulties students.

In connection with the above problems, researchers interested in applying a learning model that makes the students are motivated to learn, do not be shy to ask and wanted to develop his knowledge of the subject matter presented which have been considered difficult by students. One model of learning appropriate to achieve the objectives as stated above is through Discovery learning model.

Characteristic of discovery learning is discovery. Each student must perform discovery to find the concept of the material to be studied. This model provides an opportunity for students to discover and construct their own knowledge. Balim (2009) mentions that discovery learning model is one variation learning model that can enhance the activity of the students and the teacher as a mentor. Discovery Learning can improve student learning outcomes and skills of the student invention compared to using traditional learning models. Alex and Olubusuyi (2013) in their research found that there are significant differences in learning outcomes between students who use discovery learning and students who do not use discovery learning. Discovery learning has great potential to improve student learning outcomes.

Based on the description above, the writer interested to do research with title Effect Against Discovery Learning Model Mathematical Concept Training Students Ability In Triangle material in class VII SMP Negeri 5 Siborongborong, North Tapanuli.

## II. Literature Review

### 2.1 The understanding of the concept of Mathematics

The understanding is the ability to see the relationships between the various factors or elements in the situation that every problematic. The understanding of the looks on over the ingredients from one form of other kebetuk, interpretation and estimate (Hamalik, 2010:48). In line with the Sagala (2005:157) understanding ( *Comprehension* ) is an ability to understand and understand something after something was known or remembered and redefining the meaning of the material or materials to be learned. While according to Dimiyati and Mudjiono (2006:27) the understanding that includes the ability to capture the meaning and the meaning of the learned.

Now the indicator shows the understanding of the concept of ( Kesumawati , 2008:4), among others are: 1) stating the a concept , 2) Classify objects according to certain attributes , 3) gave examples and non examples from the concept of , 4) presents the concept in various forms of mathematical representation , 5) Develop conditions need to/conditions quite a concept.

### 2.2 Learning Model Discovery

According to Sund "discovery is mental processes where the students are able to assimilate a concept or principle". Mental processes is observed, digest, understand, mengolong-golongkan, create suspicion, explains, measure, make the conclusion and etc. (Roestiyah, 2001:20). While according to Jerome Write "discoveries is a process, a way/ways in approaching the problem rather than a product or specific knowledge item". Thus in the view write, learning with the discovery is learning to find where a student is faced with a problem or situation that seems strange so that students can search for solution (Markaban, 2006:9).

The stages of the use of *Discovery learning model* in learning according to Amien (1987) can be described as follows:

- a. The first phase is the discussion. At this stage the teachers give the question to the students to discuss in together before the students work sheets given to the students. This stage is intended to reveal the concept of the beginning of the students about the materials to be learned.
- b. The second stage is the process. At this stage students conduct laboratory activities in accordance with the instructions found in the student work sheet to prove as well as find the concept that in accordance with the concept of the righteous.

c. The third stage is a troubleshooting step. After the laboratory activity the students were asked to compare the result of the discussion before the laboratory activities with the result after the laboratory in accordance with the student work sheets to find the correct concept about issues that want to broken.

### III. Methodology

The population of this study was all students of seven grade of SMP Negeri 5 Siborongborong North Tapanuli in academic years 2013/2014 consisting of three classes. While the sample is chosen randomly selected were students of class VII-1 totaling 30 students. The instrument in this research is the test of students' mathematical concepts mastery. The test is in the form of pre-test and post-test on the Triangle material.

To obtain the required data in this study used a data collection tool that is pre-test and post-test. Before the test is used in advance the content of the test is validated. In addition to the validity test by the validator, the test is also in statistical validity test, reliability test, the level of difficulty, and distinguishing features.

The technique analysis data is to calculate the average score, calculate the standard deviation, normality test, linear regression hypothesis testing, correlation coefficients, coefficients of determination and correlation coefficient significance test.

Determining the arithmetic mean of each variable with the formula: (Sudjana, 2001: 67), namely:

$$\bar{X} = \frac{\sum f_1 x_1}{\sum f_1}$$

The standard deviation can be searched by the formula (Sudjana, 2001: 94), namely:

$$S = \sqrt{\frac{n \sum xi^2 - (\sum xi)^2}{n(n-1)}}$$

Normality test is used to determine whether the distribution of a data is normally distributed or not, the distribution of which is shaped like the normal curve. To test whether the sample normal distribution or not used Liliefors normality test with the following steps:

a. Observations  $X_1, X_2, \dots, X_n$  is used as the raw numbers  $Z_1, Z_2, \dots, Z_n$  by using the formula  $Z_i = \frac{X_i - \bar{X}}{s}$  (

$\bar{X}$  and  $s$  each represents the average and standard deviation of the sample.

b. For each of these raw numbers, and uses the standard normal distribution list, and then calculated the odds  $F(Z_i) = P(Z \leq Z_i)$ .

c. Then calculated the proportion of  $Z_1, Z_2, \dots, Z_n$  less than or equal to  $Z_i$ . If this proportion is expressed by  $S(Z_i)$ , then

$$Z = \frac{\text{banyaknya } Z_1, Z_2, \dots, Z_n \text{ yang } \leq Z_i}{n}$$

d. Compute the difference  $F(Z_i) - S(Z_i)$  and define the absolute price.

e. Take the greatest price in the absolute prices of those differences. The price of this call  $L_{0(\text{count})}$ .

f. If  $L_{0(\text{count})} < L_{\text{table}}$  then the sample comes from a normally distributed population.

Regression linearity test is used to determine the relationship of Discovery learning model (X) with the mathematical concept mastery (Y). It needs to be determined for the regression equation to describe the relationship between the two variables. If both variables have a linear relationship then the formula used is:

$$\bar{Y} = a + bX$$

Where:

$\bar{Y}$  : dependent variable

X: independent variable

a and b: regression coefficient

$$a, b \text{ by the formula: } a = \frac{(\sum Y_1)(\sum X_1^2) - (\sum Y_1)(\sum X_1 Y_1)}{n \sum X_1^2 - (\sum X_1)^2}$$

$$b = \frac{n \sum X_1 Y_1 - (\sum X_1)(\sum Y_1)}{n \sum X_1^2 - (\sum X_1)^2}$$

Testing criteria are as follows: if  $F_{count} < F_{table}$  then  $H_0$  is accepted and if  $F_{count} \geq F_{table}$  then  $H_0$  is rejected. The hypothesis to be tested is formulated as follows:

$$H_0 : Y = \alpha + \beta X$$

$$H_1 : Y \neq \alpha + \beta X$$

$$F_{hitung} = \frac{JK(TC)/(k-2)}{JK(E)/(n-k)}$$

After the test prerequisites is fulfilled, then continue correlation coefficient test to determine the relationship between discovery learning model to the students' mathematical concept mastery and the coefficient of determination test to determine how much influence the discovery learning model to the students' mathematical concept mastery. Correlation coefficient test using the product moment formula:

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{\{N \sum X^2 - (\sum X)^2\} \{N \sum Y^2 - (\sum Y)^2\}}}$$

Where:

$r_{xy}$ : the correlation coefficient between x and y

X: independent variable

Y: the dependent variable

N: the size of the subject

To determine the level of relationship between the variables X and Y can be explained by the correlation coefficient table of Guilford Emperical Rulesi namely:

**Table 1.** Correlation coefficient

Correlation value	Information
0.00 - <0.20	The relationship is very weak
$\geq 0,20$ - <0.40	low Relationships
$\geq 0.40$ - <0.70	Relations moderate / sufficient
$\geq 0,70$ - <0.90	Strong relationship / high
$\geq 0.90$ - <1.00	The relationship is very strong / high sangan

(Muhidin and Abdurahman, 2007: 128)

#### IV. Result And Discussion

##### 4.1. Result

Based on the results obtained by analysis of the average value of student learning outcomes (post-test) of 71.66. This suggests that the ability of students' mathematical concept mastery is good. From the result of the research, it is found that the significant variables are expressed by  $F_{count} > F_{table}$  or  $6.89 > 4.20$  so that  $H_0$  is rejected and  $H_1$  is accepted which means that variable X has a linear relationship to variable Y or there is a linear relationship between discovery learning model to students' mathematical concept mastery.

The observations result of the sample class with the Discovery Learning Model obtained the lowest score is 50 and the highest score is 93.75. The average value is 74.375 and a standard deviation is 12.58.

**Table 2.** Data Value Observations

No.	Xi	Fi	Average
1	50	3	
2	56.25	2	
3	65.2	1	
4	68.75	4	74.375
5	75	8	
6	81.25	5	
7	87.5	5	
8	93.75	2	
	amount	30	

Results of post-test in the sample class obtained the lowest score is 45, the highest score is 100, the average value is 71.666 and a standard deviation is 13.02. The post test sample data of class can be seen in the following table:

**Table 3.** Data Value Posttest

No.	$X_i$	$F_i$	Average
1	45	1	
2	50	2	
3	55	1	
4	60	2	
5	65	5	
6	70	4	
7	75	6	71.666
8	80	5	
9	85	1	
10	95	2	
11	100	1	
	amount	30	

Based on the results regression test obtained correlation coefficient  $(r) = 0.4442$ , which means variables X and Y have the relationship is strong enough for  $(r) = 0.4442$  or between Discovery learning model and the ability to understand mathematical concepts students on the subject of the Triangle has enough relationship / medium. And the results of the calculation, the coefficient of determination  $(r^2)$  By  $0.2 = 20\%$ , which means the effect of applying the learning model of Discovery the ability of students' understanding of mathematical concepts by 20% and the rest influenced by other factors.

Based on the calculation of the regression analysis obtained regression equation  $\bar{Y} = 27,59 + 0,46x$ , In the equation of linear regression coefficient direction  $(b) = 0.46$  is positive, which means that the two variables have a positive linear relationship with a student's ability of understanding mathematical concepts in mathematics on the subject of the triangle will be increased with effect Discovery learning model.

#### 4.2. Discussion

The results obtained in this study indicate that Discovery learning has an influence on students' mathematical concepts mastery. Results were in line with the results of Yang et al (2010) which states that by learning discovery students can learn math concepts better where they are involved in the process includes taking a few examples of the concept, look and test patterns through examples, and generalization their findings with the written word right. So that students can devote their thinking efforts in such tasks and find their own individual learning. Yuliani and Saragih (2015) states that devices based Discovery learning model can improve the ability to understand mathematical concepts and critical thinking of students.

#### V. Conclusion

Based on the results of research and data analysis has been done conclusion:

1. The observation of the activity of students in the sample class to learning by applying the discovery learning model average value obtained is 74.37 with a standard deviation is 12.58 means that the activity of students during the learning both categories.
2. Post test results of students by applying the Discovery learning model obtained average value students' mathematical concepts mastery is 71.66 with a standard deviation is 13.02.
3. Simple regression equation equation  $\bar{Y} = 27,59 + 0,46x$ , In the equation obtained (a) by 27.59 and direction of the linear regression coefficient  $(b) = 0.46$  is positive, which means that the two variables have a positive linear relationship.
4. From the linearity test and the significance of regression  $F_{hitung} > F_{tabel}$  namely  $6.89 > 4.20$  it can be concluded that  $H_0$  rejected so  $H_1$  acceptable means there is influence between the Discovery learning model to the students' mathematical concept mastery.
5. Based on the calculation of correction coefficient using product moment formula obtained coefficient  $(r) = 0.4442$  and the coefficient of determination  $r^2 = 0.2$  or 20% means that the influence of the Discovery learning model to the students' mathematical concept mastery on the subject of the triangle by 20% the rest by other factors.
6. From hypotheses test can be conclude that  $H_0$  rejected and  $H_1$  accepted, which means that there is the effect of the Discovery learning model to the students' mathematical concept mastery on the subject of the triangle.

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