Discovery Learning Models and Math Mathematics Concepts Understanding

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Abstract, This study Aimed to Determine the effect of discovery learning models toward the ability of mathematics concepts understanding of the characteristic of geometry in primary school. This research was quasi experiments with quantitative approach. The design was the non-equivalent pretest-posttest control group design. The sampling technique used was cluster random sampling technique in which class VA and VB as the control class and the experiment class respectively. Data of this research were collected through a test. The result of this research showed that the Discovery Learning models had an effect on the students' abilities of mathematics concepts understanding, it was proved by the t-test calculation obtained t_score = 3.21920 and t_table = 2.00172. Thus t_score> t_table, it could be concluded that H0 rejected and H1 accepted.

1. Introduction

Mathematics is important in everyday life. Therefore, the need for learning math for kids[1], learning math has been taught to children early. In elementary school, mathematics has learned things that related child's real world. Mathematics in elementary school requires higher-level of thinking to every child to solve problems. Elementary students are required to be able to understand each concept taught by the teacher. However, students who had not focus on study find it difficult to solve the problem [2]. Thus number of students in primary schools makes learning difficult and demotivated in learning. It causes students difficult to understand mathematics learning materials.

Survey of Program for Survey International Student Assessment showed that Indonesian student achievement in mathematics was rated 45 out of 51 countries. Indonesian students only understand a matter of routine, simple calculating, measure and contextual knowledge of facts of everyday life. This shows that Indonesian students not understand all the concepts, only some of them. The survey results reflected that the ability of mathematical concepts understanding of Indonesian students still low. However, teachers also have an important role in increasing student learning outcomes.

Based on preliminary studies, namely observation and interviews with teachers and students, it was found some problems in Mathematics learning, namely using conventional model, teacher centered, less engagement students in learning, not interesting.

There is a need for change of the mindset both teaches and children in order to afford a high level thinking. This can be done by providing innovative teacher in mathematics in elementary school. One of the latest innovations is that using discovery learning in mathematics in elementary school.

Discovery Learning Model is a model that can involve students actively in learning by discovering the concept or principle in the learning process[3]–[5]. Discovery Learning is a model for developing active learning, students discover and investigate by themselves, and the results obtained would be meaningful and long-lasting in the memory of students. Discovery Learning model requires students to learn actively and independently in the learning process, so that students try to solve their own problems [6].

The purpose of Discovery Learning model is to find a concept, a principle that is not known by learners[7], Discovery Learning model can be used in mathematics to involve students to discover, master and apply the things that are useful for them. Steps of Discovery Learning model: (1) stimulation; (2) The problem statement; (3) Data collection; (4) Data processing; (5) verification; (6) generalization [3].

Innovation in teaching and learning can improve student achievement. Innovation in the learning process can use a learning model such as discovery learning model can motivate students and students understand the concept of mathematics learning material.

2. Method

Type of this research was quantitative. This study was a Quasi-Experimental research design in the form of nonequivalent control group design. This design was used to determine the effect of the Discovery Learning Model on the ability of understanding the concept of geometry. The population in this study was 189 students of grade 5 in Komplek Surau Gadang. Sample was selected through cluster random sampling technique. Sample chosen was state elementary school 13. There were class 5A and 5B as control group and experiment group respectively. Test was used as instrument of this study. The test was tried out to the students out of sample to test validity, reliability and level of difficulty and differences.
Data were analyzed using t-test as t-test was used to test the hypothesis[5].

3. Result and Discussion
3.1 Result
The pre-test was given to the experimental group and the control groups upon treatment as shown in Table 1.

Table 1., The result of pre-test

variable	Pre-test	
	Experiment group	Control group
N	30	30
Highest Mark	80	80
Lowest Mark	40	40
mean	54.17	57.33
SD	11.65	11.79
SD2	135.72	139.00

Table 1 show that the experimental class with the number of 30 students obtained the highest score of 80 and the lowest score of 40. The experimental group reached the average rank of 54.17; 11.65 for

the standard deviation; variance value was 135.72. While the control group with the number of 30 students obtained the highest score of 80 and the lowest score of 40. The average value for the control group was 57.33, then 11.79 for the standard deviation; variance value was 139.00. Description of pre-test results in the above table reveals the ability of concept understanding of geometry using Discovery Learning. Both groups were given a post-test, the results can be seen in Table 2.

Table 2. The result of post-test

| variable | Post-test | |
	Experiment group	Control group
N	30	30
Highest Mark	95	90
Lowest Mark	60	55
mean	82.17	74.83
SD	8.47	9.14
SD2	71.74	83.53

Table 2 shows that the experimental group with the number of 30 students got the highest score and the lowest score were 95 and 60 respectively. Average value of experimental group was 82.17 with a standard deviation of 8.47 and a variance value of 71.74. While, the control group with the number of 30 students obtained the highest score and the lowest score were 90 and 55 respectively. Average rating control group was 74.83 with a standard deviation of 9.14 and variance value is 83.53. Based on the description of post-test results in the table above, it can be concluded that the ability of understanding the concept of geometry of the experimental group was higher than the control group. The hypothesis needs to be tested to determine the effect of the model of Discovery Learning on the ability of understanding the concept in grade 5 at the state elementary school *Complex Surau Gadang Padang*. Analysis prerequisite test conducted to test normality and homogeneity. Normality test post-test scores are presented in Table 3.

Table 3. The result of normality test of the post-test

Group	L_0	L_table	n	α	Description
Experiment group	0.1025	0.161	30	0.05	Normal
Control group	0.1014	0.61	30	0.05	Normal

Table 3 indicates that the sample is based on a post-test scores has a normal distribution which can also be seen $L0 < L_{tables}$. Furthermore, the homogeneity test of the post-test can be seen in Table 4.

Table 4. The homogenity test of the post-test

Group	N	α	fcount	ftable	Description
Experiment group	30	0.05	1.11	1.85	Homogeneous
Control group	30	0.05			

Based on tests of homogeneity in Table 4, the F value can be calculated with the real level of α = 0.05. From the F distribution table, it can be seen that the F_count ≤ 1.11 ≤ F_table is 1.85. It can be concluded that the final test result data from both groups had a homogeneous variance at 95%.

3.2 Discussion

The results showed that there are differences in the ability of understanding the concept of using Discovery Learning Model with conventional approaches. This is proved by the results of hypothesis testing that resulted in rejection of H_0 at the 5% significance level.

Based on the results of research conducted in grade 5 of the state elementary school *Complex Surau Gadang* showed that learning process in the experimental group using Discovery Learning model reveals that students are more active and enthusiasm in learning. While in the control group, students are less motivated to learn. Therefore, Discovery Learning Model influenced on the ability of concept understanding of geometry because there was a significant difference in the test results of ability of concept understanding of students who were taught using Discovery Learning Model and the ability of concept understanding using the conventional approach[8]. It can be seen from the result of posttest given to the experimental group and the control group. Using the model of Discovery Learning in the experimental class caused the students' ability of concept understanding of geometry increase[9].

Based on the results of the post-test tests the ability of concept understanding of geometry of the average score for the experimental class is 82.17, while the average rating for the control group was 74.83. Based on data analysis t_count> t_able with3.21920 > 2.00172 then H_0 was rejected and H_1 was accepted. Thus, we can conclude that this hypothesis is accepted that Discovery Learning Model influenced on the ability of concept understanding of geometry in grade 5 of the state elementary school Komplek Surau Gadang, Padang.

4. Conclusion

The average score of post-test at experimental group applying the model of Discovery Learning was 82.17 and the average score of post-test in the control group applying conventional teaching was 74.83. Based on the results of hypothesis testing using t-test, it can be concluded that with the level of significance = 0.05 Discovery Learning model significantly influence the ability of concept understanding of geometry in grade 5 of the state elementary school Komplek Surau Gadang, Padang.

5. References

[1] V. N. Khasanah, B. Usodo, S. Subanti, I. M. Candiasa, and N. Santiyadnya, "Enhancing Students ' Interest through Mathematics Learning Enhancing Students ' Interest through Mathematics Learning," 2017.

[2] A. S. Purnami, S. A. Widodo, R. Charitas, and I. Prahmana, "Student ' s social interaction in mathematics learning," 2018.

[3] R. Sahara et al., "Discovery Learning with Scientific Approach on Geometry Discovery Learning with Scientific Approach on Geometry," 2017.

[4] A. Ciptaningtyas and H. Pratiwi, "The effect of discovery learning and problem- based learning on middle school students ' self- regulated learning The effect of discovery learning and problem-based learning on middle school students ' self-regulated learning," 2018.

[5] C. Series, "The effect of discovery learning on students ' integrated thinking abilities and creative attitudes The effect of discovery learning on students ' integrated thinking abilities and creative attitudes," 2019.

[6] C. Series, "The Influence of Students ' Self Confidence on Mathematics Learning Achievement The Influence of Students ' Self Confidence on Mathematics Learning Achievement," 2018.

[7] O. Access, "Discovery Learning for Mathematical Literacy Ability," 2017.

[8] C. Series, "Differences in students ' learning outcomes between discovery learning and conventional learning models Differences in students ' learning outcome s between

discovery learning and conventional learning models," 2018.

[9]   M. A. DeDonno, "The influence of IQ on pure discovery and guided discovery learning of a complex real-world task," *Learn. Individ. Differ.*, vol. 49, pp. 11–16, 2016.