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Discovery Learning Model on Mathematics Learning at Islamic Private Junior High School Darussalam

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Abstract: The study aims to determine whether the mathematics learning outcomes of students who learn discovery learning are better than students who learn conventionally. It also aims to find out whether the mathematics learning outcomes of students with high initial abilities and low initial abilities with discovery learning are better than students who learn conventionally. This type of research is a Quasi Experiment with quantitative approach design and used was a randomized control group only design with treatment by blocks. The population in this study were students of class VII Islamic private junior high school or MTs Darussalam Ampiang Parak, Sutera Sub District, Pesisir Selatan. The research sample was randomly selected, namely students of class VII.1 as the experimental class and VII.2 as the control class. The research data were obtained from the results of the initial ability test and the final test given after the experiment was carried out. Data analysis using t test. The results of the analysis show that: 1) The mathematics learning outcomes of students with discovery learning model are better than those taught by conventional learning, 2) Mathematics learning outcomes of students with high initial abilities and students with low initial abilities with discovery learning learning models of learning are better than students with high initial abilities. taught by conventional learning. The results could be a solution for teachers to provide learning to develop students' ability invention, especially in the discovery of mathematical concepts and problem solving both in learning and in daily life.

Keywords: Discovery learning; mathematical learning outcome; initial ability.

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INTRODUCTION

The Indonesian government through the Ministry of National Education has made efforts to improve student mathematics learning outcomes in schools, including implementing curriculum changes, improving teaching materials, improving the learning process, and providing training for mathematics teachers to achieve better results

for students. Students' mathematics learning outcomes can be seen from changes in student behavior and attitudes in learning mathematics and the development of students' mathematical abilities (Mulyanto et al., 2018; Yamarik, 2007). This is in line with what Siregar & Nara (2010) argues, that learning is a complex process which contains several aspects, namely the increase in the amount of knowledge, the ability to remember and

produce, the application of knowledge, deduce meaning, interpret and relate to reality and its existence. change as a person.

Minister of National Education Decree No. 19 years old 2005 has set Minimum Completeness Standards for Mathematics at the unit level of junior secondary education and equivalent. However, this is not in accordance with the expected results. This can be seen from the data on the average value of the National Examination at the Madrasah level in Sutera District, Pesisir Selatan District which has not reached the minimum completeness criteria.

Facts in the field also show that mathematics learning outcomes are less than optimal. From the results of informal interviews with several Mathematics teachers at MTsS Darussalam Amping Parak, Sutera District, Pesisir Selatan Regency, it was concluded that students had a very low interest in learning mathematics, it was seen that during the learning process, only a few students were active, many students only copied or cheating friends' results. So, this results in the value of students' mastery learning mathematics not being achieved optimally.

The initial assumption, one of the causes of the above is that there are several problems in the mathematics learning process. Where it starts from the teacher's teaching method that is monotonous, and does not try to provide new innovations in teaching so that it seems that teachers tend to require students to remember the material without providing opportunities for students to compile their understanding of the mathematical concept itself (Supriadi et al., 2018). Learning like this is not optimal in developing students' mathematical abilities, because students cannot hone their own mathematical skills with the real meaning of the mathematics learning process. This opinion is in line Syah (2013) that learning is an activity that is in process and is a very fundamental element in the implementation of every type and level of education. This means, the success or failure of achieving educational goals is very dependent on the learning process experienced by

students both when students are at school or in their own home or family environment.

Mathematics is a subject that hones the ability to think logically, systematically and creatively and is able to solve problems in everyday life as well as problems in the field of mathematics itself (Nisbet & Warren, 2000). (Cantor & Farfán, 2003) define mathematics as a symbolic language whose practical function is to express quantitative and spatial relationships while its theoretical function is to facilitate thinking. This is in line with the objectives of learning mathematics which are stated in curriculum 13 at the SMP / MTs level, that the development of mathematics competencies is directed at improving life skills, especially in building reasoning, communication and problem solving.

Good learning is learning that can involve students actively in learning, so that it can create an innovative and creative generation. The involvement of students in learning cannot be separated from the use of learning models that are able to direct students to be involved in learning. Rafianti et al. (2018) explains that mathematics learning is a process of students thinking critically, reasoning effectively, efficiently, being scientific, disciplined, responsible, exemplary, confident accompanied by belief in God. The teaching model is a way that teachers interact with students during the learning process or as a tool for the creation of the expected learning process. In general, it can be seen that not all students are able to find concepts from mathematics by themselves if the teacher only allows students to develop their abilities (Prayitno, 2020; Rafiqoh, 2020).

For this reason, Discovery Learning can be used, as an alternative to a useful mathematics learning model. Discovery learning is a learning model in which the teacher acts not only as the designer of the learning process but also as a guide, facilitator and motivator (Humairah et al., 2019; Kadarisma, 2016; Kartika et al., 2020; Simanjuntak et al., 2018). Wilcox & Monroe (2011) states that in discovery learning, students are encouraged to learn mostly

through their own active involvement with concepts and principals and teachers encourage students to have experiences and conduct experiments that allow them to find principles for themselves.

Based on the steps of the guided discovery learning model where the learning objectives (material) to be found or mastered by students are first set and notified to students so that students can understand and focus attention and thoughts on predetermined objects and targets. The tools and materials have been provided and determined by the teacher. The basic ideas and initiatives of the guided learning process are that the teacher motivates students by directing their explanations to finding answers and helping students perfect their answers, as well as directing students' different ideas.

Batubara (2019) explains the steps for implementing the guided discovery model, which are: 1) Formulating problems that will be given to students with sufficient data. The formulation must be clear, avoid explanations that lead to misinterpretation so that students do not misunderstand it. 2) From the data provided by the teacher, students compile, process, organize, and analyze data. The teacher only guides students when needed. The guidance given is only in the form of direction through questions or student worksheets. 3) Students compile an initial estimate from the results of the analysis carried out. 4) If deemed necessary (there is opportunity / sufficient time) the teacher can check the estimates made by the students. This is done to convince students so that they will go in the direction to be achieved. 5) If there is certainty of the truth about the initial estimate made by the student, the student is allowed to continue to breastfeed it. 6) After students find what they are doing or looking for, the teacher can give them the practice questions that have been provided

Learning mathematics using the guided discovery model will be applied, for implementation the teacher may divide students into groups / teams (at least 2 people) but to do the exercises students do it individually. The steps are: 1). The teacher provides mathematics problems / materials to

students with sufficient data for the problems to be discussed, so as not to cause misunderstandings. 2). From the problems and data provided by the teacher, students will compile, process, organize and analyze them. This can be done by students in teams formed by teachers or with peers. If there is any doubt, students may ask questions and the teacher provides guidance in the form of directions or instructions in the form of questions. 3). Students compile forecasts from the results of the analysis made and carried out in a team. 4). The teacher checks the results made by students to ensure the truth whether the students have understood it or not. 5). When the teacher has obtained assurance that the students have understood the problem given, the students are asked to work until it is finished and explain the results of their understanding to the class. 6). After students understand the material / problem by themselves, the teacher may provide practice questions or additional questions (Yuliani & Saragih, 2015).

With this guided discovery model, it is expected to facilitate students in achieving optimal mathematics learning outcomes, both students with high to low initial abilities. The results of learning mathematics in this study were seen from the ability of students to understand concepts and problem-solving abilities (Kariman et al., 2019; Supriadi et al., 2018).

This study aims, firstly to determine whether student learning outcomes with guided discovery learning are better than students with conventional learning (previously used by teachers). Second, to find out whether the learning outcomes of students with high initial ability and low initial ability students with guided discovery learning are better than students with conventional learning.

METHOD

This study uses a quantitative approach with the type of Queasy Experiment research. The research design used was a randomized control group only design with treatment by blocks (2 x 2). In this study, the treatment

given to the experimental class was the application of the guided discovery model (discovery learning), while the control class used conventional learning.

The population in this study were all grade VII students of MTsS Darussalam Amping Parak, Sutura District, Pesisir Selatan Regency who were registered in the 2020/2021 school year. The total sample was 53 students consisting of 2 classes. The sample class was randomly selected, namely class VII.1 as the experimental class totaling 27 students, and class VII.2 as the control class totaling 26 students.

The instruments in this study were the initial ability test and the final test in the form of description questions. The initial ability test was given at the beginning of the study, the aim was to determine the students' initial ability in mastering the prerequisite material for studying the set material. The final test is a test of the ability to understand concepts and solve mathematical problems which are given after the experiment is completed to see students' mathematics learning outcomes.

The conceptual understanding indicators developed in this study are restating a concept, classifying objects according to certain properties, presenting concepts in various forms of mathematical representation, using, utilizing and selecting certain procedures or operations, and applying problem-solving concepts or algorithms. Meanwhile, the problem-solving indicators developed in this study are according to Polya, namely understanding the problem, making plans / problem solving strategies, solving problems based on the strategies that have been made and interpreting the solutions obtained (making conclusions).

Before the test questions are given to students, first the test questions are validated by the validator and test questions are carried out. Obtained 5 questions consisting of test questions of concept understanding ability and problem-solving abilities which are made based on indicators of the ability to understand concepts and solve mathematical problems.

Students' initial abilities were grouped into students with high initial abilities and students with low initial abilities based on the average value, namely ($\bar{x}$). Students whose scores are large and equal to the average score ($\geq \bar{x}$) are included in the high initial ability while students whose scores are below the average ($< \bar{x}$) are included in the low initial ability.

The learning outcome test data obtained during the study were analyzed in order to see first, whether the experimental class students' average mathematics learning outcomes were higher than the control class students, secondly whether the experimental class students' average mathematics learning outcomes were higher than the control class student's initial abilities. The data analysis technique used is the t test to test the research hypothesis. Before conducting the hypothesis test, the prerequisite test is carried out first, namely the normality test and the homogeneity test of the students' mathematics learning outcomes test scores.

RESULT AND DISCUSSION

The data of this research are mathematics learning outcomes data on two abilities, namely the ability to understand concepts and problem-solving abilities obtained through the final test conducted at the end of the study. This final test question is in the form of an essay with 5 items consisting of 2 questions on the ability to understand concepts and 3 questions on the ability to solve problems.

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From the final test data obtained from the experimental class students' mathematics learning outcomes after being given treatment

by applying guided discovery learning and control class with conventional learning as follows.

Table 1. Data Description of Experiment Class dan Class Control

Class	$\bar{x}$	S	x_{maks}	x_{min}
Exp.	83.70	13.05	100	50
Control	70.19	13.38	90	50

Judging from the higher average value of the experimental class with a value distribution that does not spread far to the average value shows that, in general, students with discovery learning get a score close to 83.70 with 70% of students obtaining a score above the average. This means that students with discovery learning have gained better mathematical understanding and abilities and have reached a minimum standard of completeness in mathematics learning outcomes. Whereas for students with conventional learning with an average value of 70.19 with a more spread out, it shows that there are still many students who have not reached the minimum completeness standard, namely 50% of students are still below the average score. Furthermore, to find out more, it will be seen in the results of hypothesis testing on the learning outcomes of the two classes.

Before doing the hypothesis, first the normality test and homogeneity test were carried out on the final test scores of the two sample classes. The results of the normality test using the Kolmogorov-Smirnov test can be seen in the following table.

Table 2. Normality test of Class Sample

Class	Criteria	
	Significance	Inf.
Experiment	0,054	Normal
Control	0,121	Normal

Table 3. Normality Test based on pre students' ability

Pre-Ability	Criteria	
	Significance	Inf.
High	0,062	Normal
Low	0,183	Normal

From the results of the normality test, it was found that the mathematics learning outcomes of the experimental class and control class were normally distributed. And the mathematics learning outcomes data based on the students' initial abilities were also normally distributed.

The next analysis prerequisite test was the variance homogeneity test using the Levene test. The results of the analysis can be seen in Table 4.

Table 4. Homogeneity Test of Result Test

Class	Sig.	Inf.	Pre-Ability	Sig.	Inf.
Experiment	0.319	Hom	High	0.052	Hom
Control		ogen	Low		ogen

Based on Table 4, it is found that the significance value of all data is greater than 0.05, it can be concluded that the data has a homogeneous variance, namely for: 1) the final test scores of the experimental class and the control class students' learning outcomes, 2) the final test scores of the learning outcomes of students with abilities high initial and low initial ability students in the experimental class and the control class.

Based on the analysis requirements test, each group of data is normally distributed and homogeneous and then a hypothesis is tested. The statistical test used for hypotheses 1 and 2 is the t test. The t test results are obtained as follows.

Table 5. Hypothesis Test 1 on Learning Outcome Score of Mathematic

Hypothesis	Class	N	Sig.
1	Experiment	27	0,000
	Control	26	

Table 6. Hypothesis 2 on Learning Outcome Score of Mathematic Based Pre-Ability

Pre-Ability	Class	N	Sig.
High	Experiment	16	0,000
	Control	13	
Low	Experiment	11	0,010
	Control	13	

Based on the results of the statistical test calculations in Table 5 and Table 6, it is found that the significance is smaller than 0.05

for hypotheses 1 and 2. This shows that H0 is rejected and H1 is accepted. It can be concluded that: (1) Mathematical learning outcomes of students with discovery learning are higher than students with conventional learning and 2) Mathematical learning outcomes of students with high and low initial abilities in the experimental class differ significantly from students with high and low initial abilities who are taught by conventional learning.

Based on testing the first hypothesis, it was found that students' mathematics learning outcomes with discovery learning were higher than students taught using conventional learning. This is because students have constructed their knowledge according to their own abilities in discovery learning. Through teaching materials in the form of worksheets which are presented in the form of questions or problems that must be resolved, students carry out investigations and work with groups to find solutions to these problems. So students acquire knowledge they do not yet know, not through notification, but through their own discovery.

Bruner (2009) argues that the learning process will run well and creatively if the teacher provides opportunities for students to find a concept, theory, rule, or understanding through examples found in their life. The use of discovery learning, changes the conditions of passive learning to be active and creative. Alfieri et al. (2011) states that in discovery learning, students are encouraged to learn mostly through their own active involvement with concepts and principals and teachers encourage students to have experiences and conduct experiments that allow them to discover principles for themselves. Themselves. Kurniasih & Sani (2014) also pointed out some of the advantages of the discovery learning model, namely creating a sense of joy in students, because of the growing sense of investigation and success, students will understand basic concepts and ideas better.

Based on the students' answers to discovery learning classes on concept understanding questions, it was found that

many students were correct in classifying objects according to certain properties, presenting concepts in various forms of mathematical representation, using, utilizing and selecting certain procedures or operations, and applying concepts or algorithms. Solution to problem. This shows that discovery learning can train students' concept understanding skills to develop better.

The thing that affects the results of students' understanding of the concept is because students have adapted to the discovery process during discovery learning. Where in the process of discovery students are guided by the teacher with the problems and data provided by the teacher then students compile, process, organize and analyze them until students find the correct conclusions and concepts.

Based on the results of the experimental class students' answers to problem solving problems, it was found that the students were correct in identifying the problem, applying the correct concept in solving and completing the final answer to the problem-solving problem. The good ability of students' problem solving is due to the fact that in discovery learning students are accustomed to problems as a stimulus to develop thinking skills to obtain concepts and see the relationship between problems and some mathematical concepts.

The results of this study are also in line with Syafti (2020) research conclusion that discovery learning can facilitate student learning in developing students' conceptual understanding skills and mathematical problem-solving abilities.

The second hypothesis testing part one, it was found that the mathematical learning outcomes of students with high initial abilities who were taught by the discovery learning model were higher than those who were taught with high initial abilities who were taught by conventional learning. This is because in discovery learning, students share and discuss in groups to investigate a given problem, thus helping students with high initial abilities to increase their activeness in sharing with

students with low initial abilities. Students who have high initial abilities can explain ideas or strategies in solving problems that are being studied when helping friends in their group. According to Maufur (2020) discovery learning results have a better transfer effect, improve students' reasoning and thinking abilities, train students' cognitive skills to find and solve problems without the help of others.

From the results of students' answers to high initial abilities in the experimental class with discovery learning on conceptual understanding questions, it was found that students were correct in stating and presenting concepts in various forms of mathematical representation, using, utilizing and selecting certain procedures or operations, and applying concepts. Furthermore, in problem solving problems with indicators of understanding the problem, making plans / problem solving strategies, solving problems based on the strategies that have been made and interpreting the solutions obtained (making conclusions), there are still some students with high initial abilities in the experimental class who are wrong in choosing the solution strategy so that the conclusion of the settlement obtained is also wrong.

Students with high initial abilities with conventional learning on conceptual understanding questions on indicators of stating and presenting concepts in various forms of mathematical representations have been correct. But in the indicators of using, utilizing and selecting certain procedures or operations, and applying problem-solving concepts or algorithms, many students are still wrong in applying the concept to the problem.

In problem solving problems, there are still many students with high initial ability in conventional class who misunderstand the problem, so that the strategy and solution to the problem are also wrong.

From the results of the analysis of the answers of students with high initial abilities in discovery learning class, it can be concluded that students already have better understanding of concepts and problem-solving abilities than the ability of conventional class students based

on the indicators of concept understanding and mathematical problem solving abilities under study.

The second hypothesis testing part 2 shows that the mathematical learning outcomes of students with low initial abilities who are taught with the discovery learning model are higher than those taught by low initial abilities taught by conventional learning. This is because during the learning process, students with low initial abilities, discovery learning classes have adapted to learning that trains to think and find solutions to questions and problems given by the teacher and conduct joint investigations with students with high initial abilities in the group.

In conventional learning, the opportunity to find problems alone or collaborate with friends is very limited because the learning process is dominated by the teacher. Afandi (2018) states that conventional learning is oriented towards teacher activities and prioritizes teaching activities, and students are mostly passive listening to teacher descriptions. So conventional learning is interpreted as entering the content or material from the book to students so that they can retrieve test time information. This resulted in students' understanding of mathematical concepts in the control class not developing properly.

From the analysis of the answers of students with low initial abilities in discovery learning classes on concept understanding questions, it was found that nearly 60% of students had correctly stated and presented concepts in various forms of mathematical representation, used, utilized and selected certain procedures or operations, and applied concepts. Whereas in problem solving problems with indicators of understanding the problem, making plans / problem solving strategies, solving problems based on strategies that have been made and interpreting the solutions obtained (making conclusions), there are still some students with low initial abilities in the experimental class who misunderstand the problem so that the wrong choice of settlement strategy and the conclusion of the solution obtained.

Students with low initial abilities with conventional learning on conceptual understanding questions on indicators of stating and presenting concepts in various forms of mathematical representation, using, utilizing and selecting certain procedures or operations, and applying problem-solving concepts or algorithms, many students are wrong. Whereas in the problem-solving problem of students with low initial abilities in the conventional class there are still many who misunderstand the problem, so that the strategy and solution to the problem are also wrong.

From the results of the analysis of the answers of students with low initial abilities in the discovery learning class, it can be concluded that students already have better understanding of concepts and problem-solving abilities than the abilities of conventional class students based on the indicators of concept understanding and mathematical problem-solving abilities under study.

CONCLUSION

AND

RECOMMENDATION

Based on the results of the analysis and discussion that has been described, the following conclusions are obtained. Students' mathematics learning outcomes with discovery learning are better than students' mathematics learning outcomes using conventional learning. Mathematics learning outcomes of students with high initial abilities taught with discovery learning models are better than students with high initial abilities with conventional learning. Mathematics learning outcomes of students with low initial abilities taught with discovery learning models are better than students with low initial abilities with conventional learning.

Based on the results of the research, the discussion and conclusions that have been described can be put forward as follows: The guided discovery learning model (discovery learning) can be an alternative in learning for materials that require higher order thinking skills in mathematics. Further research can be applied to discovery learning model learning to

see its effect on other students' mathematical abilities.

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