



Improving Mathematical Reasoning Skills Through a Discovery Learning Model for Junior High School Students in Karawang Dstrict

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Received: March 19, 2023	Revised: March 22, 2023	Accepted: March 25, 2023	Online: March 27, 2023
ABSTRACT The purpose of this study was to determine the improvement of mathematical reasoning ability through the discovery learning model for students in one of the junior high schools in Karawang Regency. This research used quantitative approach with quasi-experimental method and nonequivalent control group design. This research was conducted on junior high school students in grade VIII with purposive sampling technique. The sample of this study consisted of two classes, namely class VIII C received a direct learning model and class VIII E received a discovery learning model. Each class amounted to 35 out of 432 students in class VIII. The research results were processed using the Mann-Whitney test. Based on the data processing, it was found that there was an achievement and improvement in mathematical reasoning ability of students who obtained discovery learning model better than direct learning. Keywords: <i>Discovery, Learning, Model.</i>			

Journal Homepage <https://ejournal.iainbatanghari.ac.id/index.php/attasyrih/index>

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How to cite: Apriyanti, Apriyanti. (2023). Improving Mathematical Reasoning Skills Through a Discovery Learning Model for Junior High School Students in Karawang Dstrict. *At-Tasyrih: Jurnal Pendidikan dan Hukum Islam*, 9(2), 376-383.
<https://doi.org/10.55849/attasyrih.v9i2.206>

Published by: Pusat Penelitian dan Pengabdian Masyarakat, Institut Agama Islam Nusantara Batang Hari

INTRODUCTION

Mathematics is one of the sciences that has an important role in all fields. In everyday life, everyone is at least involved in simple calculations, such as addition, subtraction, multiplication and division. Therefore, mathematics is one of the important subjects for students to master. In the Regulation of the Minister of National Education of the Republic of Indonesia (Permendiknas) Number 22 of 2006 concerning content standards (Asman dkk., 2023), one of them states that mathematics learning aims to enable students to use reasoning on patterns and properties to perform mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements (Yeltriana dkk., 2023). Thus, the purpose of learning mathematics is to improve the quality of education at school, especially in mathematics subjects. One of the mathematical abilities that students must have in learning mathematics is mathematical reasoning ability (Minarti dkk., 2023). According to Patrick and Finden (Rizkianto in Muhamad, 2015) that mathematical reasoning ability is one of the five power components that must be possessed by students in learning mathematics. Based on this, mathematical

reasoning ability is one of the important learning objectives of mathematics to be possessed by students (Mustajab dkk., 2023). However, the reality in the field shows that students' mathematical reasoning skills are not optimal (Ulum dkk., 2023). In one of the public junior high schools in Lemahabang District, Karawang Regency, there are many high-achieving students who have low reasoning skills.

This is in line with the observations and experiences of researchers during the learning process at school (Roshayanti dkk., 2023). During this time the teacher only carried out learning procedurally, only providing formulas and then doing exercise questions, without giving students the opportunity to find the meaning of what was learned (Gusvita & Alon, 2021). In addition, the low mathematical reasoning ability is caused by students' lack of understanding of the concepts given. In the learning process, students passively accept what is delivered by the teacher (Pamungkas & Halimah, 2023). In addition, the problems given by the teacher tend to have similar solutions to the examples given. So that it results in students not practicing their reasoning power (Musalib & Dylan, 2021). This can be seen in the assessment, evaluation of the process and student learning outcomes. Based on data from the results of daily math tests, there are still many students who get scores below the KKM 70 (Mudinillah & Rizaldi, 2021). Judging from the percentage, only 25.71% of students scored above 70. While students who got the right KKM score of 70 were 15.71% (Arsul dkk., 2021). And those who scored below KKM 70 were 58.58% (Nida dkk., 2023). From these low achievement results, the objectives of learning mathematics are still far from the target, which includes producing students who have good abilities in communication, reasoning, problem solving, connections, and mathematical representations.

Based on research conducted by Sulistiawati (Muhamad, 2015) that learning difficulties in developing mathematical reasoning skills of junior high school students on the surface area and volume of pyramids show that mathematical reasoning questions have not been mastered by students (Zarnuji, 2023). This can be seen from the answers of students who only able to answer 14.29% and obtained the result that the average percentage of student difficulty was 85, 71% of the six questions tested.

Based on the description above, to improve mathematical reasoning ability, it is necessary to improve the learning process at school (Farid, 2023). Efforts to optimize learning activities need to be carried out from planning to evaluating learning. One of the optimizations in learning is to use the discovery learning model (Amirudin dkk., 2022). Because this learning model has advantages, one of which is expressed by Marzano which states that the discovery learning model can improve students' mathematical reasoning and ability to think freely (Teguh dkk., 2023). Meanwhile, according to Suryosubroto (Rahman and Maarif, 2014) that by discovering for themselves, investigating for themselves, the results obtained will be loyal and long-lasting in memory, not easily forgotten by students (Afifah dkk., 2023). Thus it can be concluded that self-discovered understanding is an understanding that is truly mastered and easily used or transferred in other situations. So that students can actively participate in learning. This is in accordance with the ability to be improved in this study, namely mathematical reasoning ability.

In the research of Burais, et al (2016) entitled improving students' mathematical reasoning skills through the discovery learning model, it was found that the improvement of mathematical reasoning skills of students who obtained learning with the discovery learning model was better than those who obtained conventional learning (Muhammadong dkk., 2023). Whereas in Ahmad's research (2015) entitled improving the mathematical reasoning ability of trigonometric material through the application of the discovery learning model.

discovery learning with a scientific approach in class X SMA Negeri 11 Makasar can improve the reasoning ability of class X students, this can be seen from the results of the mathematical reasoning ability test which is classified in the high category (Pathurohman dkk., 2023). In addition, in Santoso's research (2015) entitled improving the mathematical reasoning ability of 9th grade students of SMPN 1 Jaken through guided discovery learning, the results showed that discovery learning can improve the mathematical reasoning ability of IX-E students with an average increase of 6.7.

From the description above, teachers are required to be more creative and professional in choosing learning models that are in accordance with the characteristics of students and the material to be taught (Alberty dkk., 2023). The learning process must be more directed at what students must master by using a learning model that can make students active in the learning process (Sitinjak dkk., 2023). So that is the reason for researchers to use the discovery learning model because with this learning model students are more motivated to be directly involved, experience, find solutions and skillfully solve problems from the problems being observed, and have an impact on creating an active and creative learning situation which results in students being able to develop reasoning skills, especially in answering questions.

Thus, researchers are motivated to examine mathematics learning using the discovery learning model on improving students' mathematical reasoning skills (Arumi Sunarta dkk., 2023). So this research is titled "Improving Mathematical Reasoning Ability through Discovery Learning Model for Junior High School Students in Karawang Regency".

RESEARCH METHODOLOGY

This research uses a quantitative approach. While the research method used is quasi-experiment. The design used in this study is a nonequivalent control group design. According to Sugiyono (2014: 118) that in this design neither the experimental group nor the control group was randomly selected. Thus, the subjects were not grouped randomly (Hassan dkk., 2023), but the researcher determined based on the study group and students' prior knowledge. This is done because new groupings in the field are often not possible. In this research design, there are two groups, namely the experimental group given the treatment of mathematics learning by applying the discovery learning model and the control group given the direct learning model.

The diagram of nonequivalent control group design according to Russeffendi (Yoanditra, 2015) is:

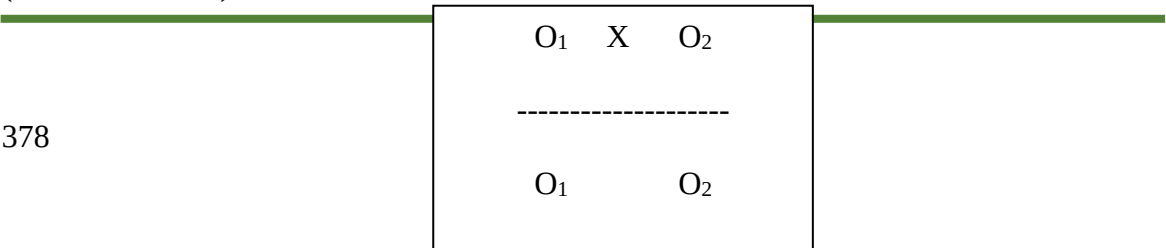


Figure 3.1
Research Design

Description:

O1 : Pretest in the form of mathematical reasoning ability test

O2 : Post-test in the form of mathematical reasoning ability test

X : Mathematics learning using discovery learning model

----- : Subjects are not randomly grouped.

The population of this study were all VIII grade students of public junior high school in one of the schools in Lemahabang District, Karawang Regency, totaling 432 students (Herliani dkk., 2023). The sampling technique in this study was carried out by purposive sampling, according to Sugiyono (2014: 126) that purposive sampling is a sampling technique with certain considerations. The sample of this study consisted of two classes, namely class C and class E each totaling 35 students (Arifuddin dkk., 2023). Class E was used as the experimental class and class C was used as the control class. The reason the researchers chose the sampling technique was because the two classes were homogeneous in other words the classes had the same ability. This is based on the average value of the two classes the difference is not significant.

Research instruments are tools for researchers used to collect data in research. The instrument used in this research is a test instrument. With a written test in the form of a description (Adema dkk., 2023). This test instrument is a test of students' mathematical reasoning skills given to both classes, namely the experimental class that obtained the discovery learning model and the control class that obtained direct learning. This test instrument is given to students at the beginning of the study (pretest) and at the end of the study (posttest).

In order not to cause subjectivity in scoring student answers, researchers make scoring guidelines that refer to the scoring rubric to measure students' mathematical reasoning ability (Hardana dkk., 2023). The criteria or scoring guidelines according to Lestari and Yudhanegara (2015: 182) which have been modified are as follows.

Table 3.1
Scoring Guidelines for Mathematical Reasoning Ability

Indicators of Mathematical Reasoning Ability	Question Item Number	Answer Classification		
		No Answer	Inaccurate Answer	Answer Correctly
Making estimates	1		$0 < \text{Skor} < 25$	$\text{Skor} = 25$
	2		$0 < \text{Skor} < 25$	$\text{Skor} = 25$
	3		$0 < \text{Skor} < 30$	$\text{Skor} = 30$
	4		$0 < \text{Skor} < 20$	$\text{Skor} = 20$
Draw analogies	5	$\text{Skor} = 0$	$0 < \text{Skor} < 50$	$\text{Skor} = 50$
Drawing	6		$0 < \text{Skor} < 15$	$\text{Skor} = 15$
generalizations	7		$0 < \text{Skor} < 15$	$\text{Skor} = 15$
	8		$0 < \text{Skor} < 25$	$\text{Skor} = 25$
	9		$0 < \text{Skor} < 25$	$\text{Skor} = 25$
	10		$0 < \text{Skor} < 30$	$\text{Skor} = 30$

RESULT AND DISCUSSION

The data processed and analyzed in this study were pretest, posttest and normalized gain scores for mathematical reasoning ability. The following is presented descriptive statistics of pretest, posttest, and normalized gain scores in tabular form.

Table 4.2

Descriptive Statistics

Mathematical Reasoning Ability

Variables	S	N	Discovery Learning			Direct Learning		
			Pretes	Postes	N-Gain	Pretes	Postes	N-Gain
Mathematical Reasoning Ability	$\bar{x}$		28,46	64,71	0,52	26,40	49,77	0,29
	S	35	10,15	12,72	0,17	35	10,14	8,78
								0,07

Based on Table 4.2 above, it can be seen that the mean of the pretest of mathematical reasoning ability of students in the class who received discovery learning and direct learning, it can be seen that the difference in the mean of the pretest of the two groups is 2.06, so it can be said that the initial ability of the two class groups is not much different. The standard deviation of the pretest of mathematical reasoning ability of students who received discovery learning and direct learning were 10.15 and 10.14, respectively. This means that the data distribution of mathematical reasoning ability of students in the discovery learning class is larger or more spread out than the direct learning class.

Furthermore, the mean of the post-test scores of mathematical reasoning ability of students who obtained discovery learning and direct learning, it can be seen that the difference in the mean of the post-test of the two groups is 14.94 so it can be said that the final ability of the two class groups is different and the post-test of mathematical reasoning ability of students who obtained discovery learning is higher than the class that obtained direct learning. Likewise, with the value of the standard deviation, the class that

obtained discovery learning post-test value for the standard deviation was 12.72 while the class that obtained direct learning was 8.78 with a difference of 3.94. It is clear that the standard deviation value of the discovery learning class is greater than the direct learning class. This means that the distribution of students' final mathematical reasoning ability of the class that obtained discovery learning is more spread out than the class with direct learning.

CONCLUSION

Based on the results of the data and findings in this study, the following conclusions are obtained:

1. The achievement of mathematical reasoning ability of students who obtained discovery learning model was better than students who obtained direct learning.
2. The improvement of mathematical reasoning ability of students who obtained discovery learning model (medium level) is better than students who obtained direct learning (low level).
3. The difficulties faced by students in solving mathematical reasoning ability questions for students who obtained the discovery learning model and those who obtained direct learning were in the indicators of drawing generalizations and proving directly.

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