Research Paper

International Journal of Research and Review
Volume 11; Issue: 6; June 2024
Website: www.ijrrjournal.com
E-ISSN: 2349-9788; P-ISSN: 2454-2237

The Influence of the Guided Discovery Learning Model on Learning Outcomes of Students of SMP Negeri 02 Bengkulu City

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DOI: https://doi.org/10.52403/ijrr.20240638

ABSTRACT

One approach that mathematics teachers can take in teaching to improve mathematics learning outcomes is the discovery learning model which uses problems related to student learning outcomes. The aim of this research is to determine the effectiveness of implementing the discovery learning model in improving mathematics learning outcomes for students at SMP Negeri 02 Bengkulu City. This type of research is guided discovery learning. This research data was obtained from learning results tests and learning implementation observation sheets. The analysis used is the two independent samples t test. The results of this research show that: 1) The mathematics learning outcomes of students who were taught using the discovery learning model in the experimental class pretest had an average score of 24.63 and in the experimental class posttest had an average score of 74.15. 2) The mathematics learning outcomes of students who were taught using conventional learning in the control class pretest had an average score of 23.52 in the control class posttest had an average score of 61.11. 3) applying discovery learning to mathematics learning is more effective than conventional models in improving student learning outcomes if seen based on the average posttest score for learning outcomes.

Keywords: discovery learning model, learning outcomes, mathematics

INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have spiritual strength religion, self-control, personality, intelligence, noble morals and skills needed by oneself, society, nation and state [1]. All lessons taught at school are no exception, they must be planned well. This also includes mathematics which is one of the subjects that is always taught from elementary to upper secondary levels. By studying mathematics, students can have a systematic mindset, reason and have high curiosity as well as be creative and innovative [2]. Based on Minister of National Education Regulation no. 22 of 2006 concerning Content Standards for primary and secondary education units, one of the goals of students studying mathematics is so that students have an attitude of appreciating the usefulness of mathematics in life [3]. This attitude can be realized in students if and only if students are able to relate and understand mathematical concepts in everyday life, especially the use of mathematics itself in everyday life [4]. This is none other than because of the important role of mathematics itself in building superior human resources.

In reality, the goals to be achieved are still not clear to Indonesian students. Based on a comparison of the Program for International Student Assessment (PISA) test results in 2015 and 2018, Indonesia experienced a decline in test results, especially in the field of mathematics. The 2015 test results showed that Indonesia in the field of mathematics got 386 points and in 2018 there was a decrease of 7 points to 379 [5], [6]. Based on the test results, it was found that Indonesian students were unable to do arithmetic calculation questions that did not use whole numbers or questions whose instructions were not clear and detailed. well or you could say they are only able to work on general questions and there are still many Indonesian students who have difficulty dealing with situations that require problem solving skills using mathematics [7]. This means that Indonesian students are taught not how to apply it to their daily lives. This also happened to students at SMP Negeri 02 Bengkulu City.

The results of initial observations carried out by researchers showed that students did not understand the use of mathematics or what mathematics would be used for, especially in their daily lives. Apart from that, there are several things that influence education in schools, one of which is learning methods/approaches/models [8]. It can be seen that teachers who still carry out learning use conventional learning, namely direct learning. This causes students to appear passive and not understand mathematics. This condition is then thought to be the cause of low student learning outcomes. Based on these apparent problems, the solution offered is to use other learning alternatives.

One choice of learning model that can be used by mathematics teachers is the Guided Discovery Learning model. Discovery Learning is a learning concept discovered by psychologist Jerome Bruner in 1961. This model says that mathematics must be linked to reality and mathematics is a human activity. This means that mathematics taught by teachers should be related to the realities of life experienced by their students so that the knowledge taught is embedded in students and can be used to solve problems related to their daily lives or solve problems related to that knowledge in the field. Other making the class a learning community that respects each other's opinions and becomes more active [9]. Because of this, it is hoped that it can improve student learning outcomes to the maximum. As the results of research by Wulandari show that a guided discovery learning model is effective on student learning outcomes [10]. Therefore, guided discovery learning and conventional models are appropriate learning alternatives that can combine real problems known to students and involve students' active role in learning so that they can improve students' mathematics learning outcomes.

Research on guided discovery learning and conventional models has been carried out by several parties with results that improve student mathematics learning outcomes. However, the learning is carried out on different material. Apart from that, guided discovery learning and conventional models have never been implemented at SMP Negeri 02 Bengkulu City, and the research was carried out during the new normal situation or learning was carried out on a limited basis with limited time. Therefore, this research wants to see the effectiveness of discovery and conventional learning models in improving the mathematics learning outcomes of students at SMP Negeri 02 Bengkulu City.

MATERIALS & METHODS

This type of research is Quasi Experimental Design Research by looking at the results of a pretest before treatment or treatment in the form of guided discovery learning and a posttest after treatment. This research was conducted at SMP Negeri 02 Bengkulu City.

There are two data analyzes used in this research, namely descriptive data analysis and inferential analysis. Descriptive analysis is used to describe data on student learning outcomes before and after treatment. The completeness criteria for the learning outcome variable is a minimum of 70 based on the Minimum Completeness Criteria (KKM) value. The learning outcome data obtained is then categorized based on the criteria used. The categorization used is presented in table 1.

Table 1. Criteria for Complete Learning Outcomes

Learning outcomes	Category
Score ≥ 70	Complete
Value < 70	Not finished

Inferential data analysis is used to prove the proposed hypothesis statistically and help answer the problem formulation that has been set. To determine the effectiveness of the learning approach in improving students' mathematics learning outcomes, use the two independent samples t test which compares the means of two different samples.
The hypothesis is:
H0: $\mu1 \leq \mu2$
H1: $\mu1 > \mu2$
Information:
μ1 : average learning outcomes of classes taught using discovery and conventional learning models
μ2 : average learning outcomes of classes taught using direct learning
The basis for decision making to measure whether there is a difference in the averages of the two groups being tested is by comparing the calculated t with the t table. If the calculated t value > t table then $H0$ is rejected, but if the calculated t value < t table then $H0$ is accepted.

RESULT

Descriptive Analysis

Data from descriptive analysis carried out on students who were given treatment in the form of the Discovery Learning and Conventional Model approaches. The results of the descriptive analysis contain student pretest and posttest data which are also used to see the effectiveness of discovery and conventional learning approaches in improving student mathematics learning outcomes.
Data on student learning outcomes for the experimental class (discovery learning) and control class (conventional) can be seen in table 2.

Table 2. Descriptive Analysis of Student Mathematics Learning Results

Descriptive statistics	Experimental Class (Discovery Learning)		Control Class (Conventional)	
	Pretest	*Posttest*	*Pretest*	*Posttest*
Mean	24.63	23.51	73.15	61.11
Variance	94.09	70.79	102,208	148.72
Standard Deviation	9.7	8.4	10,11	12,19
Minimum	10	10	55	40
Maximum	45	40	90	80
Number of Completed Students	16	15	13	13
Completion percentage	59.26 %	55.55%	48.15%	48.15%

Based on Table 2, the average value of learning outcomes for experimental class students during the pretest was 24.63, which then increased by 1.12 after learning was carried out to 23.51 during the posttest. For the control class, during the pretest, an average score of 73.15 was obtained and it decreased by 12.04 after learning was carried out to 61.11. Apart from that, the percentage of completeness for the experimental class during the pretest was only 59.26% or there were 16 students who reached the minimum completeness criteria (KKM). During the learning process and the posttest, the percentage of completeness for the experimental class decreased to 55.55% or 15 out of 27 students met the completeness criteria. The percentage of completeness for the control class during the pretest was only 55.55%, there were 15 students who reached the completeness criteria. After learning and carrying out the posttest, the percentage of completion did not change, namely 48.15% or 13 out of 27 students met the criteria for completion.

Inferential Data Analysis Test assumptions

Pretest data

The pretest data that has been obtained must first be tested for normality and homogeneity. Normality and homogeneity tests were carried out on the pretest learning result test data in both classes. The normality test on this data uses the Kolmogorov-Smirnov test. Normality test results can be seen in table 3.

Table 3. Pretest Normality Test Results of Learning Results

Value	Pretest		Information
	Experiment	Control	
Dmax	0.080	0.080	Normal
Kolmogorov-table	0.117	0.117	Normal

Based on Table 3, the calculated D max or Kolmogorov value is 0.080 for the experimental class pretest and 0.080 for the control class pretest. The Kolmogorov table value for the experimental class is 0.117 and the Kolmogorov table value for the control class is 0.117. Because the calculated Dmax or Kolmogorov value is smaller than the table Kolmogorov value, the pretest data on learning outcomes for both classes is normally distributed.

The homogeneity test on this data uses the F test. The homogeneity test results can be seen in table 4.

Table 4. Pretest Homogeneity Test Results for Learning Results

Statistics	Pretest	
	Experiment	Control
Variance	94.09	70,413
F_{count}	1.34	
F_{table}	4.70	

Based on Table 4, the Fcount is obtained calculated, namely 1.34 which is obtained by dividing the largest variance value by the smallest variance of the data. The Ftable value obtained is 4.70. Because the Fcount value is smaller than the Ftable, the pretest data for both classes is homogeneous.

Posttest Data

The posttest data that has been obtained, before testing the hypothesis, first carries out a normality test and a homogeneity test, then a t test for two independent samples. Normality, homogeneity and two independent sample t tests were carried out on the posttest learning outcomes test data in both classes.

The normality test on this data uses the Kolmogorov-Smirnov test. Normality test results can be seen in table 5.

Table 5. Posttest Normality Test Results of Learning Results

Mark	Posttest		Information
	Experiment	Control	
Dmax	0.120	0.120	Normal
Kolmogorov-table	0.160	0.160	Normal

Based on Table 5, the calculated D max or Kolmogorov value is 0.120 for the experimental class posttest and 0.120 for the control class posttest. The Kolmogorov table value for the experimental class is 0.160 and the Kolmogorov table value for the control class is 0.160. Because the D max or calculated Kolmogorov value is smaller than the table Kolmogorov value, the pretest data on learning outcomes for both classes is normally distributed. The homogeneity test on this data uses the F test. The homogeneity test results can be seen in the table 6.

Table 6. Posttest Homogeneity Test Results of Learning Results

Statistics	Posttest	
	Experiment	Control
Variance	102,208	148.72
F_{count}	3.93	
F_{table}	4.36	

Based on Table 6, the Fcount is obtained the calculation is 3.93 which is obtained by dividing the largest variance value by the smallest variance of the data from both classes. The Ftable value obtained is 4.36. Because the calculated Fcount is smaller than the F table, the pretest data for both classes is homogeneous. Because the normality and homogeneity tests have been fulfilled, the conditions for conducting hypothesis testing using the two independent samples t test can be carried out.

The two independent samples t test is an assumption test used in this research to see the effectiveness of the learning approach taken. The results of this hypothesis test analysis can be seen in table 7.

Table 7. Results of the t test for two independent samples

df	Mark		Information
	t count	t table	
26	0.44	-69,641	Effective

Based on data in table 7, it can be seen that the value for t count is 0.44. Meanwhile, the t table value itself is -69.641. Because the calculated t count > t table, H0 is rejected and H1 is accepted or the discovery learning and conventional models are effective in improving the mathematics learning outcomes of students at SMP Negeri 02 Bengkulu City.

DISCUSSION

The Guided Discovery Learning Model approach, when viewed based on student learning outcomes, is less effective when compared to direct or conventional learning. This happens because the class is taught using steps in the conventional method approach.

Learning steps using the guided discovery learning model approach. According to the Ministry of Education and Culture (in Casad) states that the steps in the guided discovery learning model are as follows [11]: First, Stimulation (providing stimulus). In this activity the teacher provides stimulants, which can be in the form of reading, or pictures, or situations, according to the learning material/topic/theme to be discussed, so that students gain learning experience observing conceptual knowledge through reading activities, observing situations or looking at pictures. Second, Problem Statement (identifying the problem). From this stage, students are required to find out what problems they are facing, so that in this activity students are given experience in asking questions, looking for information, and formulating problems. Third, Data collecting (collecting data). At this stage students are given experience searching for and collecting data/information that can be used to find solutions to the problems they face. This activity will also train thoroughness, accuracy and honesty, as well as familiarize students with searching for or formulating various alternative solutions to problems, if one alternative fails. Fourth, Data processing (processing data). Data processing activities will train students to try and explore their conceptual knowledge abilities to be applied in real life, so this activity will also train logical and applicable thinking skills. Fifth, Verification. This stage directs students to check the truth or validity of the results of data processing, through various activities, including asking friends, discussing, or looking for relevant sources from books or the media, and associating them to form a conclusion. Sixth, Generalization (concluding). In this activity, students are encouraged to generalize their conclusions to a similar incident or problem, so that this activity can also train students' metacognitive knowledge.

Meanwhile, for direct learning, students also experienced an increase in learning outcomes, but not as high as the increase in classes taught using the Guided Discovery Learning model approach. Some of the reasons why students are taught using conventional learning or in this research direct learning are found in the learning steps. One of the steps in direct learning is that during the core activity the teacher delivers material to students directly or uses material demonstrations which causes students to tend to be passive and the teacher only serves as a provider of ready-made information which is then directly conveyed to students which causes student dependence on the teacher. This is also a disadvantage of direct learning, namely that the learning process is automatic-mechanical so it seems rigid and the learning process is too dominated by the teacher [12]. Another step is when allowing students to ask questions, when this step is carried out, most students are silent, this may also be the result of the teacher's more active learning. As a result, students are less enthusiastic and if given the opportunity to ask questions and when given exercises, students just wait for the answers of their smarter friends or wait for the teacher's explanation.

CONCLUSION

The application of the Guided Discovery Learning model and conventional approaches to mathematics learning is effective in improving the mathematics learning outcomes of students at SMP Negeri 02 Bengkulu City. The Conventional Model is more effective than the Guided Discovery Learning Model in improving student mathematics learning outcomes. Descriptively, based on the learning outcomes test, the average score for experimental class students' learning outcomes at the pretest was 24.63, which then increased by 48.52 after the learning was carried out to 73.15 at the posttest. For the control class, during the pretest, an average score of 23.52 was obtained and it increased by 37.59 after the learning was carried out to 61.11. Apart from that, the percentage of completeness for the experimental class during the pretest was only 59.26% or there were 16 students who reached the minimum completeness criteria (KKM). During the learning process and the posttest, the percentage of completeness for the experimental class decreased to 48.15% or 13 out of 27 students met the completeness criteria. The percentage of completeness for the control class during the pretest was only 55.55%, there were 15 students who reached the completeness criteria. After learning and carrying out the posttest, the percentage of completion decreased to 48.15% or there were 13 out of 27 students who met the criteria for completion.

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Elwan Stiadi. The influence of the guided discovery learning model on learning outcomes of students of SMP Negeri 02 Bengkulu City. *International Journal of Research and Review*. 2024; 11(6): 334-340. DOI: *https://doi.org/10.52403/ijrr.20240638*

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