THE EFFECTIVENESS OF IMPLEMENTING THE PROCESS ORIENTED GUIDED INQUIRY LEARNING (POGIL) LEARNING MODEL TO LEARNING OUTCOMES IN MATHEMATICS

Nurul Widiasih[1*], Munadi[2], Eleonora Dwi Wahyuningsih[3]

[1]Nurul Widiasih (TEGAL)
[2]Munadi (TEGAL)
[3]Eleonora Dwi Wahyuningsih (TEGAL)

[*]Corresponding author: nurulwidiasih91@gmail.com

Abstract

The purpose of this study was to describe the use of the Process Oriented Guided Inquiry Learning (POGIL) learning model for student learning outcomes in mathematics. As the population for this research, there are 320 students in class VIII of SMP Negeri 3 Adiwerna for the 2022/2023 academic year, divided into 10 classes. Samples were taken using Cluster Random Sampling. Samples were taken from 3 classes including the experimental class using the POGIL learning model, the control class using the Problem Solving learning model, and the trial class. Data was taken using test techniques, questionnaires and documentation. To test the validity and reliability of the instrument, it was first tested in a trial class where there were 31 students present in the class. Data analysis for this study used a One Right Party Proposition Test, a One-way MANOVA Test, and Right Sided t Test. The results of the study showed: (1) The results of learning mathematics for class VIII students of SMP Negeri 3 Adiwerna applying the POGIL learning model could exceed the specified KKM 76 resulting in an achievement of 85%, (2) There were differences in learning outcomes between students who took learning with the POGIL learning model and students who take part in learning with Problem Solving learning in mathematics for class VIII students of SMP Negeri 3 Adiwerna, and (3) Application of the POGIL learning model can improve learning outcomes for class VIII students of SMP Negeri 3 Adiwerna.

Keywords: Effectiveness, PPGIL, Learning Outcomes.

1   INTRODUCTION

Susongko (2017:1) argues, "Learning is something that is scientific. Learning can be the joint result of the process of: (1) Initial abilities, (2) Teaching, and (3) Experiences outside the classroom." Thus, initial abilities are abilities possessed by students before experiencing the learning process. Therefore, the initial abilities of these students are potential abilities which then turn into actual abilities when the learning process is carried out. The actual abilities resulting from this learning process are called learning outcomes.

The learning process is said to be successful if the learning outcomes achieved by students in a subject matter have met or exceeded the Minimum Completeness Criteria (KKM) and minimum classical completeness that have been determined.

Performance on these learning outcomes is behavior that can be observed or measured by students in certain situations. This means that performance measures aspects of behavior carried out in a certain period. To measure performance, it is necessary to carry out mental tests. This mental test is a performance test in which the subject is asked to do something rather than say something. Performance testing is a type of test to determine the subject's ability to handle something, not just symbols.

As for the learning process for the 2022/2023 academic year at SMP Negeri 3 Adiwerna, regarding the mathematics learning process, there are various problems faced by teachers in educating students, including: (1) Independence in learning mathematics is not optimal, (2) Student activity is low, and (3) Learning outcomes are still unsatisfactory. In learning activities the teacher uses the Problem Solving learning model with the method of providing material and questions and then students are asked to solve their own problems and do assignments, where students must be able to find solutions to problems, and are required to be active during the learning process.

Learning outcomes based on classical completeness in class VIII of SMP Negeri 3 Adiwerna for the 2022/2023 academic year only reach 15% of classical completeness, with a Minimum Completeness Criteria (KKM) score of 76. Where the classical completeness set by SMP Negeri 3 Adiwerna is 85%. From the problems above, the appropriate variation of learning model to overcome the problem of student learning outcomes is the Process Oriented Guided Inquiry Learning (POGIL) learning model. In the POGIL learning model the teacher does not directly validate student answers, but the teacher will invite students to find out whether the answer is correct or not correct.

The POGIL learning model is an inquiry-based learning model that can help teachers to instill concepts, so students don't just memorize formulas, but students are required to be able to discover for themselves, work collaboratively, be creative, be able to apply a concept, and associate it with new contexts. Through POGIL learning students can find answers to a problem in their own way, and can play an active role during the learning process, thereby increasing learning outcomes and learning independence in mathematics. In this POGIL learning model, students are not allowed to be passive, where students in the class do not have the opportunity to 3D (Come, Sit, and Be Still).

2 METHODOLOGY

In this research, the approach taken is a quantitative approach, because the data is in the form of numbers and the data analysis method uses statistics. The form of treatment given in this study was the use of the POGIL learning model. The aim of this research is to find out the results of the analysis which are presented in the form of numbers which will then be explained and interpreted in a description. The research was conducted on class VIII students in the even semester of SMP Negeri 3 Adiwerna Tegal Regency for the 2022/2023 academic year.

In this study the type used is the type of experimental research. This is because the aim of this research is to investigate whether there is a causal relationship, and the extent of the causal relationship between learning outcomes and learning independence by comparing the experimental and control groups.

The research design used in this research is Posttest-only Control Design, in this research design a post-test is given to two groups that have been chosen randomly, namely one experimental class in class VIII H applying the POGIL learning model and one control class in class VIII G applies the Problem Solving learning model.

The average final test (post-test) scores in the experimental class and the control class will be compared to predict whether there are significant differences in learning outcomes between the two classes. The results of the research design can be seen in the following table:

Table 1. Research design

Group (Sample)	Treatment	Post-test
K_K	X_1	Y
K_E	X_2	

Information:
K_K : Experimental Class (Class VIII H)
K_K : Control Class (Class VIII G)
Y   : Learning outcomes
X_1 : Treatment with the Problem Solving learning model
X_2 : Treatment with the POGIL learning model

The sample in this study was implemented into three classes, namely the trial class, control class, and experimental class, each consisting of 32 students if all were present, namely: (1) Class VIII J as the trial class, namely the class used to test learning outcome tests in the control class and experimental class; (2) Class VIII G as the control class, namely the class that uses the Problem Solving learning model; and (3) Class VIII H as the experimental class, namely the class that will use the POGIL learning model. The measurement results in this study used a post-test to measure student learning outcomes in mathematics.

Data collection techniques in this study used tests and documentation. The test is an instrument or tool used to determine student learning outcomes. The test will be used to measure the increase in the value of mathematics learning outcomes from the control class and the experimental class. The test equipment applied is an objective test in the form of multiple choices. The test is carried out as a post-test to

determine the value of the learning outcomes of the control class and experimental class. Documentation is a search for data collected by researchers at research sites that contain certain records. In this research, the documentation required is in the form of a list of names of students, number of students, and data on final semester assessment grades for class VIII of SMP Negeri 3 Adiwerna, Tegal Regency, academic year 2022/2023.

3 RESULTS

3.1 Description of Research Object

The object of this research is SMP Negeri 3 Adiwerna. The population taken was students from class VIII, Even Semester, 2022/2023 academic year, totaling 10 classes consisting of 320 students. Sampling used the Cluster Random Sampling technique. The samples taken consisted of three classes including: Class VIII J as a trial class, class VIII G as a control class that applied the Problem Solving learning model, and class VIII H as an experimental class that applied the POGIL learning model. Each class has 32 students. The main material taught is the Pythagorean theorem. The KKM for class VIII junior high school mathematics, even semester 2022/2023, is 76.

In class VIII, the condition of students before being taught using the POGIL learning model still tends to be passive. This is because the teacher uses a learning model that is quite commonly applied, one of which is the Problem Solving learning model, where the learning process is still teacher-centered, even though applying problem solving, but students have not been able to explore freely to solve the given mathematical problems. by the teacher. So that students rely more on memorizing formulas from the material being studied, without probing in more detail because of their curiosity about the material being studied.

3.2 Description of Research Variable Data

The data in this study are the students' learning outcomes from the results of the final math scores (post-test) in the form of a multiple choice test which totals 25 items. The administration of a learning achievement test and an independent mathematics learning questionnaire was given to Grade VIII students in the even semester of SMP Negeri 3 Adiwerna for the 2022/2023 academic year which were divided into two groups, namely the control class which applied the Problem Solving learning model and the experimental class which applied the POGIL learning model.

3.2.1 Control Class

The learning model used in the control class is the Problem Solving learning model, namely students in class VIII G of SMP Negeri 3 Adiwerna. The distribution of data on mathematics learning outcomes of control class students is as follows:

Table 2. Frequency Distribution of Control Class Learning Outcomes.

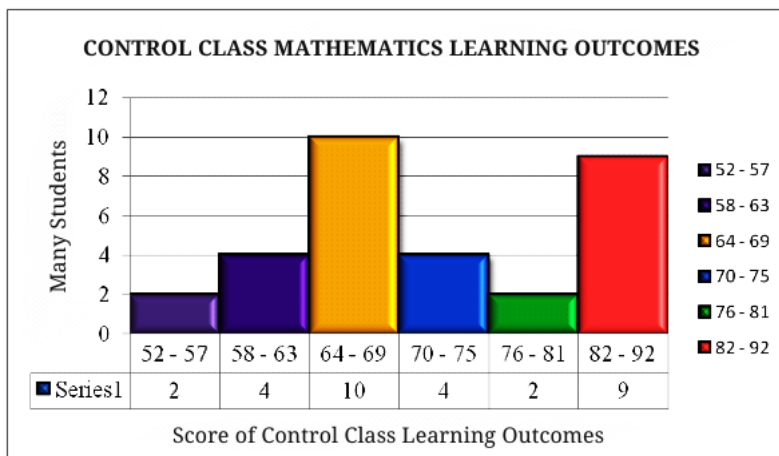| Test Scores of Learning Outcomes	Many Students	Relative Frequency
52 - 57	2	6,452%
58 - 63	4	12,903%
64 - 69	10	32,258%
70 - 75	4	12,903%
76 - 81	2	6,452%
82 - 92	9	29,032%
Total	31	100%

Figure 1. *Histogram of Control Class Mathematics Learning Outcomes*

Judging from Figure 1, the mathematics learning results of control class students who applied Problem Solving show that the fewest students who got scores were in the interval 52 to 57 and the interval 76 to 81, namely 2 students respectively and the most students The students who got scores were in the interval 64 to 69, namely 10 students.

3.2.2 Experimental Class

The learning model used is the POGIL learning model. The application of the POGIL learning model is used for students in class VIII H of SMP Negeri 3 Adiwerna which is an experimental class. The distribution of data on the results of learning mathematics for POGIL class students is as follows:

Table 3. *Frequency Distribution of Experimental Class Learning Outcomes.*

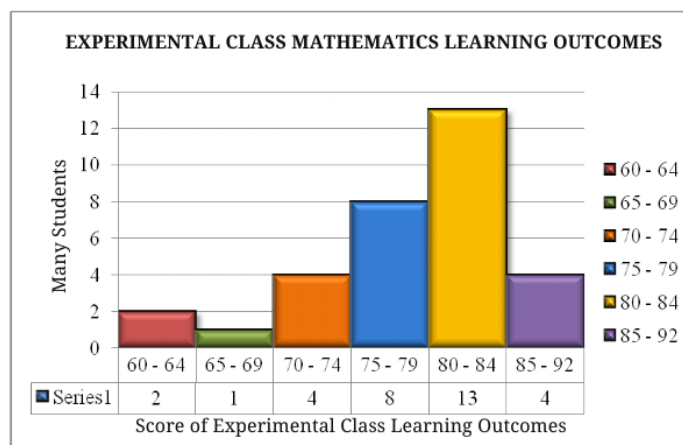| Test Scores of Learning Outcomes	Many Students	Relative Frequency
60 - 64	2	6,250%
65 - 69	1	3,125%
70 - 74	4	12,500%
75 - 79	8	25,000%
80 - 84	13	40,625%
85 - 92	4	12,500%
Total	32	100%

Figure 2. *Histogram of Experimental Class Mathematics Learning Results*

Seen from Figure 2, the learning outcomes in the experimental class were that the least number of students got a score in the interval 65 to 69, namely 1 student and the most students who got a score were in the interval 80 to 84, namely 13 students.

The comparison of statistical data on the mathematics learning outcomes of experimental class (POGIL) and control class (Problem Solving) students is as follows:

Table 4. *Statistical Data on Learning Outcomes of Experimental and Control Classes*

Ukuran	Control Class (Problem Solving)	Experimental Class (POGIL)
Mean	70,968	79,000
Median	68	80
Modus	64	84
St. Deviasi	10,429	7,326
Varian	108,766	53,677
Tetinggi	92	92
Terendah	52	60
Koef. Variansi	0,147	0,093
Jangkauan	40	32

From Table 4, it can be described that the mean value of the learning outcomes test for the experimental class that uses POGIL is greater than the control class that uses Problem Solving. Apart from that, it is reinforced by the coefficient of variance value for the experimental class which is smaller than the control class, so the experimental class has better learning outcomes. better than the control class. Thus, it can be concluded that the learning outcomes of the POGIL class are better than the Problem Solving class.

3.3 Hypothesis Testing

In this research, hypothesis testing was carried out as follows:

3.3.1 One Right Party Proportion Test

Hypothesis testing is used to answer the first hypothesis, namely calculating the completeness of the learning outcomes of students who are taught using the POiGIL learning model where the hypothesised value of the hypothesis is 85%, then a one-sided right-hand hypothesis test is carried out. The following is a summary of the calculation results of the one right party proposition test.

Table 5. *One Right Party Proportion Test Results*

Variable	Process Oriented Guided Inquiry Learning (POGIL) Learning Model	
	z_{count}	z_{table}
Mathematics Learning Outcomes	2,093	1,670

$z_{count} = 2,093$ and $z_{table} = 1,670$ Then the results are combined with the z table values using the real level α = 5% then we get $z_{count} > z_{count}$ so Ho rejected. This means: The application of the POGIL model is effective in improving learning outcomes in the mathematics subject for class VIII students at SMP Negeri 3 Adiwerna.

3.3.2 One-way MANOVA Test

One-way MANOVA test for the second hypothesis, namely to find out whether or not there is a significant difference in student learning outcomes between students who take part in the lesson by implementing the POiGIL lesson model and students who take part in the lesson by implementing the Proibleim Soilving lesson model in mathematics subjects for class VIII students at Negeri Middle School 3 Adiwerna.

Table 5. *One-way MANOVA Test Results*

Variable	λ_{count}	λ_{table}
There are differences in POGIL Mathematics Learning Outcomes	0,815	0,903

Calculation of Oinei-way MANOiVA test results is based on Table 9, with a significant level of α = 5% then generate $\lambda_{count} > \lambda_{table}$ so Ho rejected. This means: There is a significant difference in learning outcomes and independence in learning mathematics between students who take part in learning using the POiGIL learning model and students who take part in learning using the Probleim Solving learning model in mathematics subjects for class VIII students at Negeri 3 Adiwerna Middle School.

3.3.3 Right Sided t Test

The right-sided t test is used to answer the third hypothesis. The third test is to find out which mathematics learning outcomes are better between students who take learning using the POGIL learning model and students who take learning using the Problem Soilving learning model. While the fourth hypothesis is to find out which independent mathematics learning is better between students who take lessons using the POGIL learning model and students who take lessons with the aim of applying the Problem Solving learning model to mathematics in class VIII students of SMP Negeri 3 Adiwerna. With this in mind, a right-tailed t test was performed.

Table 7. *Right Sided t Test Result*

Variable	t_{count}	t_{table}
Learning Outcomes	3,574	2

Based on the table above, so $t_{hitung} = 3,574$ and $t_{table} = 2$ then the results are consulted with the table value t using a significant level α = 5% obtained $t_{count} > t_{table}$ so Ho rejected. This means: The mathematics learning outcomes of students taught using the POGIL learning model are better than students taught using the Problem Solving learning model.

4 CONCLUSIONS

Based on the results of research conducted on class VIII students of SMP Negeri 3 Adiwerna for the 2022/2023 Academic Year, the following conclusions are obtained:

[1] The results of learning mathematics for class VIII students of SMP Negeri 3 Adiwerna applying the POGIL learning model can exceed the set KKM of 76 resulting in an achievement of 85%

[2] There are differences in learning outcomes between students who take learning using the POGIL learning model and students who take the Problem Solving learning model in mathematics for class VIII students of SMP Negeri 3 Adiwerna

[3] The application of the POGIL learning model can improve the mathematics learning outcomes of Grade VIII students of SMP Negeri 3 Adiwerna.

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[2] Teachers

Teachers should be able to carry out activities in the form of preparing teaching program plans by considering students' needs, managing classes by presenting lessons using methods that can improve mathematics learning outcomes.

[3] Students

Students should have the initiative to search for sources by using smartphones to research the lessons they are solving. Students should be able to prepare for learning independently with lots of practice questions, even if there is no assignment from the teacher.

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