

# Improving Mathematics Learning Outcome Using Inquiry Learning Model at Vocational School

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## ABSTRACT

This study aimed to improve the mathematics learning outcome using the inquiry learning model for students in a vocational school. This was a classroom action research. The subjects of this study were 29 students at vocational school. The instruments are (1) Observation Sheet for students and teacher activities, (3) Mathematics test, and (4) Student Response Questionnaire. The data collection techniques were tests and observations. The data that has been collected was analyzed quantitatively and qualitatively. The results of the quantitative analysis showed an increase in students' learning outcomes. It was also seen that the ability of teachers to manage learning increased from 3.53 (very good) to 3.58 (very good). In addition, the student activity has increased from 49.19% to 75.17%. Lastly, the student responses were 94% of students gave a positive response. Based on the results of these studies, it could be concluded that the Inquiry Learning Method improves the students' mathematics outcomes at this studied vocational school.

**Keywords:** *Learning Quality, Inquiry.*

## 1. INTRODUCTION

The quality of teaching depends on selecting the right strategy to achieve the learning objectives, significantly developing students' creativity and innovative attitudes. For this reason, teachers need to develop their professional abilities as educators to manage teaching programs by employing teaching and learning strategies to support the development process of their students. . .

This study observed one class at a private vocational school in Makassar, South Sulawesi. This class was grade XI in the office administration class. Based on the observations, they still used the teacher-centered learning model. The students also were still not active in learning activities because, during the learning process, the teacher gave a lot of lectures about the topic. The activities carried out by students were listening and taking notes. They rarely ask questions or express opinions. Based on the data obtained, it was stated that the mid-semester exams of the class XI Office Administration were very low, among 28 students, 6 students who passed, and 22 students who did not pass the exam. Based on these data, it is necessary to apply an innovative learning method to improve the students' mathematics learning outcome that was previously low.

One innovative method and constructive learning model was the inquiry learning model. Inquiry means a question, or examination, of an investigation.

Inquiry is a general process that humans do to find or understand information [1]. The teacher's role in learning with the inquiry model is a guide and facilitator. The teacher's job is to choose a problem that needs to be solved. However, it is also possible that the student selects the problem to be solved. The next task of the teacher is to provide learning resources for students to solve problems. Teacher guidance and supervision are still needed, but intervention on student activities in problem-solving must be reduced.

The inquiry learning method is designed to invite students to the scientific process quickly. Research shows that inquiry exercises can improve scientific understanding, creative thinking, and students become skilled in obtaining and analyzing information. The steps that must be taken in inquiry learning, according to Ibrahim and Nur (2000), are (1) Student orientation to problems (2) Organizing students in learning. (3) Guiding individual and group investigations. (4) Presenting the results of activities. (5). Evaluating activities [1]

## 2. RESEARCH METHOD

This is classroom action research. In short, classroom action research can be defined as reviewing various learning activities, which aims to reveal the causes of multiple learning problems and,

more importantly, to provide solutions in the form of actions to overcome these learning problems.

Classroom action research is research conducted by teachers in their classrooms through self-reflection [1]. To achieve this goal, classroom action research is carried out through stages which include: planning, implementing actions, observing/collecting data, and reflecting. The flow and stages of implementing class actions are as follows. For more details, please see the chart.

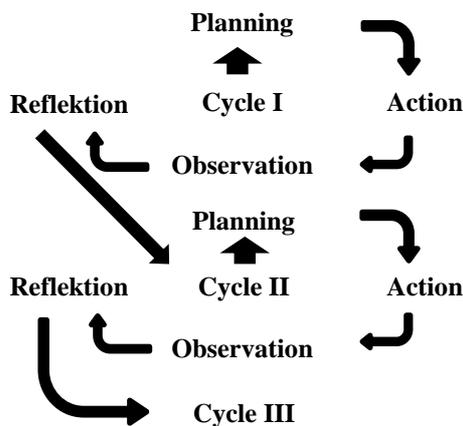


Figure 1. Classroom Action Research Model Diagram by Kemmis and McTaggart [4]

This research was conducted at a private vocational school in Makassar, South Sulawesi, Indonesia. There were 29 students in grade XI at the Office administration class, consisting of 4 male and 25 female students.

### 3. RESULTS AND DISCUSSION

This research begins with observation activities to identify problems that occur in the learning process and as an effort to find solutions. Researchers conducted interviews with teachers and saw the results of the Mid-Semester of the class. To find out the problems that caused low student learning outcomes. The application of the inquiry learning method in classroom action research is carried out in 2 cycles of activity. The following is the observational data in cycle I

#### 3.1. Teachers' Ability Observation Results

To determine how the teacher's ability to manage learning in the classroom was used, an observation sheet was on the implementation of learning. The aspects assessed are:

Table 1. Learning implementation in class for cycle 1

Teacher Activities	Meeting			Average	Category
	I	II	III		
<b>Initial activity (±10 minutes)</b>					
<b>Phase 1: Communicating learning objectives and motivating students</b>					
1. The teacher conveys the lesson by greeting, praying together, and checking student attendance	4	4	4	4	Very good
2. The teacher conveys the learning objectives	3	4	4	3.66	Very good
3. The teacher motivates students about the importance of the material to be studied	2	3	3	2.66	Good
<b>Core activities (±60 minutes)</b>					
<b>Phase 2: The teacher presents information</b>					
1. The teacher conveys information/matrix material by way of demonstrations or through reading materials	3	3	4	3.33	Good
2. Guiding students to recognize the subject matter	3	3	3	3	Good
<b>Phase 3: Organizing Students Into Study Groups</b>					
1. The teacher asks students to form groups of 4 to 5 people.	3	3	3	3	Good

2. The teacher distributes worksheets related to the concept of the material to students and asks students to discuss solving problems in the worksheets	2	3	3	2.66	Good
<b>Phase 4: Helping the group work and study</b>					
The teacher guides the students when working on the LKS	3	4	4	3.66	Very good
<b>Phase 5: Evaluation</b>					
1. The teacher asks several groups to present the results obtained and invites other groups to respond.	3	3	4	3.33	Good
2. The teacher allows students to ask things that have not been understood and provide reinforcement for students' answers	3	4	3	3.33	Good
<b>End activities</b>					
<b>Phase 6: Giving Rewards</b>					
1. Give awards to students both in groups and individually	3	4	3	3.33	Good
2. The teacher asks students to conclude the material	3	3	4	3.33	Good
3. The teacher conveys the material to be studied at the next meeting	3	3	3	3	Good
4. The teacher closes the meeting by saying greetings	3	4	4	3.66	Very good
<b>Average</b>				<b>3.53</b>	<b>Very good</b>

Based on Table 1, the several components observed in the first cycle after being analyzed, the overall average was 3.53. The criteria for the teacher's ability to manage to learn were in the "very good" category.

3.2. Result of Observation of Student Activity Cycle I

**Table 2.** Student Activities During the Learning Process in Cycle 1

No	Observed Components	Meeting				TEST OF CYCLE I
		I	II	III	IV	
1	Record the results of the discussion	75.86	79.31	68.96		
2	Give opinions to the teacher or other students.	44.83	44.83	34.48		
3	Respond to teacher questions/instructions.	24,14	41.38	41.38		
4	Participate in groups.	65.52	79.31	62.07		
5	Presenting the results of their group work.	20.68	31.03	24,14		

Data on student activity during the implementation of the first cycle was obtained through the observations of student activities during the teaching and learning process at each meeting. Can be seen from Table 2 below:

**Table 3.** Statistics of Student Test Scores in Cycle 1

Statistics	Statistical Value
Subject	29
Ideal Score	100
Average Score	65
Highest Score	80
Lowest Score	45
Score Range	35

Table 3 shows that the average score (mean) of mathematics learning outcomes after the Inquiry Learning Method is implemented is 65 from the ideal score of 100. While individually, the scores spread out by students with the highest score was 80 and the lowest score 45 a score range was 35. After the student test scores are grouped into five categories, the distribution of frequency and percentage is obtained in Table 4.

**Table 4.** Distribution of Frequency and Percentage of Test Results Scores in Cycle 1

Score Interval	Category	Frequency	(%)
$0 \leq x < 54$	Very low	7	24.13
$55 \leq x < 69$	Low	6	20.69
$70 \leq x < 70$	Currently	13	44.83
$80 \leq x < 89$	High	3	10.35
$90 \leq x \leq 100$	Very high	-	-
Total		29	100%

Table 4 shows that the level of student ability is still lacking. In addition, according to the average score of the test results in Cycle I, which is 65. This means that the average score of mathematics learning outcomes for students after the Inquiry Learning Method is still in the low category. Overview of student learning outcomes in the class obtained based on the score of learning outcomes are as follows:

**Table 5.** Student Learning Outcome in Cycle 1

Score	Category	Frequency	Percentage (%)
$0 \leq x < 70$	Not pass	13	44.82
$70 \leq x \leq 100$	Pass	16	55.18
Amount		29	100

**Table 6.** Learning Implementation in Cycle 2

Teacher Activities	Meeting			Average	Category
	I	II	III		
<b>Initial activity (10 minutes)±</b>					
<b>Phase 1: Communicating learning objectives and motivating students</b>					
1. The teacher conveys the lesson by greeting, praying together, and checking student attendance	4	4	4	4	Very good
2. The teacher conveys the learning objectives	3	4	4	3.66	Very good
3. The teacher motivates students about the importance of the material to be studied	2	3	3	2.66	Good
<b>Core activities (±60 minutes)</b>					
<b>Phase 2: The teacher presents information</b>					
1. The teacher conveys information/matrix material by way of demonstrations or through reading materials	3	3	4	3.33	Good

### 3.3. Reflection for Cycle 1

The first meeting of Cycle I was the beginning by using a new learning method that was different from what was used in previous sessions. So that this meeting is the stage of adjustment to the method applied.

Judging from the observation and evaluation of student learning outcomes, it can be concluded that in Cycle I had not achieved satisfactory results because there were still students who were less active in solving the questions given. After all, there were still students who carried out other activities during the learning activities, and there were still students who did not do their homework and group assignments.

### 3.4. Recommendation

Because the final results of Cycle I have not shown maximum results, it is necessary to continue in Cycle II. The data obtained from the observations of the second cycle is as follows:

### 3.5. Data on Teacher Ability Observation Results

To determine how the teacher's ability to manage learning in the classroom was used, an observation sheet was on the implementation of learning. The aspects assessed are:

2. Guiding students to recognize the subject matter	3	3	4	3.33	Good
<b>Phase 3: Organizing Students Into Study Groups</b>					
1. The teacher asks students to form groups of 4 to 5 people.	3	3	3	3	Good
2. The teacher distributes worksheets related to the concept of the material to students and asks students to discuss solving problems in the worksheets	3	3	3	3	Good
<b>Phase 4: Helping the group work and study</b>					
The teacher guides the students when working on the LKS	3	4	4	3.66	Very good
<b>Phase 5: Evaluation</b>					
1. The teacher asks several groups to present the results obtained and invites other groups to respond.	3	3	4	3.33	Good
2. The teacher allows students to ask things that have not been understood and provide reinforcement for students' answers	3	4	3	3.33	Good
<b>End activities</b>					
<b>Phase 6: Giving Rewards</b>					
1. Give awards to students both in groups and individually	3	4	3	3.33	Good
2. The teacher asks students to conclude the material	3	3	4	3.33	Good
3. The teacher conveys the material to be studied at the next meeting	3	3	3	3	Good
4. The teacher closes the meeting by saying greetings	3	4	4	3.66	Very good
Average				3.58	Very good

Based on Table 6, from several components observed in cycle 2 after analysis, the overall average is 3.58, which is very good.

3.6. Result of Observation of Student Activity Cycle 2

As for the results of observations obtained, an illustration that the activity and attendance of students during the learning activities of mathematics is increasing. This is indicated in Table 7

**Table 7** Student Activities During the Learning Process in Cycle 2

No	Observed Components	Meeting				TEST OF CYCLE II
		I	II	III	IV	
1	Record the results of the discussion	75.86	86.21	96.55		
2	Give opinions to the teacher or other students.	75.86	75.86	75.86		
3	Respond to teacher questions/instructions.	55.17	72.41	79.31		

4	Participate in groups.	79.31	79.31	96.55
5	Presenting the results of their group work.	55.17	55.17	68.96

Based on Table 7, it can be concluded that student activities in Cycle 2 have met the expected completeness criteria because the average percentage of student activity is above the classical completeness average, which is more than 75% of students are actively involved in the learning process.

3.7. Learning outcomes

Based on learning outcomes, namely the student learning outcomes test cycle 2, table 8 is obtained as follows:

**Table 8.** Student Test Score Statistics in Cycle 2

Statistics	Statistical Value
Subject	29
Ideal Score	100

Average Score	75.96
Highest Score	95
Lowest Score	65
Score Range	30

Table 8 shows that the average score (mean) of mathematics learning outcomes after the Inquiry Learning Method was implemented was 75.96 from the ideal score of 100. The individual scores achieved students were spread with the highest score of 95 and the lowest score of 65 with a score range of 30.

The student test scores are grouped into five categories, the distribution of frequency and percentage is obtained in Table 9.

**Table 9.** Test Results Scores in Cycle 2

Score Interval	Category	Frequency	(%)
$0 \leq x < 54$	Very low	-	-
$55 \leq x < 69$	Low	2	6.90
$70 \leq x < 70$	Moderate	17	58.62
$80 \leq x < 89$	High	7	24,14
$90 \leq x \leq 100$	Very high	3	10.34
Amount		29	100%

**Table. 10.** Student Learning outcome in Cycle 2

Score	Category	Frequency	Percentage (%)
$0 \leq x < 70$	Not Pass	2	6.90
$70 \leq x \leq 100$	Pass	27	93.10
Amount		29	100

Based on Table 10, it is described that the mathematics learning outcomes of students were 6.90% or 2 of 29 students are included in the not pass

category, and 93.10% or 27 of 29 students had in the pass category.

Table 9 shows that the level of student ability is moderate. In addition, the average score of the test results in Cycle 2 is 75.96, which is in the medium category. Overview of student learning outcomes obtained based on the score of learning outcomes is in Table 9.

### 3.8. Reflection Stage

Cycle 2 was carried out for 3 meetings, and the first time the learning outcomes test showed an increase from Cycle 1 to Cycle 2 so that learning mastery had been achieved. Students seem to be more trying to work together and discuss solving the practice questions given by the teacher. Students' self-confidence to work on practice questions on the blackboard is increasing. This can be seen from the emergence of students who have been less actively motivated to appear in front of the class to work on the given practice questions.

In general, it can be said that learning using the Inquiry Learning Model in Cycle 2 is better than Cycle 1. However, there are still some that have not been achieved. The success of Inquiry learning in Cycle 2 can be seen from the increase in the average score of student learning outcomes and changes in students who are considered better than Cycle 1, from 65 in the first cycle to 75.96 in the second cycle.

The student's responses to the Inquiry Learning Method were obtained through a questionnaire given at the end of the second cycle. The student's responses to the Inquiry Learning Method can be seen in table 11.

Based on Table 11, it can be seen that the number of students who responded positively "yes" to learning using the Inquiry learning method was 94%.

**Table 11.** Student Respond

Question	Answer		Percentage	
	Yes	Not	Yes	Not
1. Do you enjoy math lessons?	27	2	93.10	6.90
2. Do you like math lessons using the Inquiry learning method?	29	0	100	0
3. Do you like the way the teacher applies the teaching method in the learning process using the Inquiry learning method?	28	1	96.55	3.45
4. Are you motivated to learn mathematics after applying the Inquiry Learning Method?	28	1	96.55	3.45
5. Can the Inquiry learning method help and make it easier for you to understand math subject matter?	26	3	89.66	10.44
6. Does the Inquiry learning method in learning make you an active student?	28	1	96.55	3.45

7. Do you enjoy sharing your knowledge and experiences in the Inquiry Learning Method?	26	3	89.66	10.44
8. Has your confidence increased in expressing ideas/opinions/questions on learning activities with the Inquiry learning method?	27	2	93.10	6.90
9. Do you feel any progress after applying the Inquiry learning method?	28	1	96.55	3.45
10. Are you easier to remember the material taught in learning mathematics through the Inquiry Learning Method?	28	1	96.55	3.45
11. Is the Inquiry learning method new to you?	27	2	93.10	6.90
<b>Amount</b>			<b>1041</b>	<b>58.82</b>
			<b>94%</b>	<b>5.34%</b>

### 3.9. Recommendation

From the two cycles that have been carried out using the Inquiry Learning Method, the following results are obtained:

1. Some students have understood the meaning of real mathematics associated with real life.
2. This model increases students' self-confidence and independence in learning. This can be seen in the results of observations.
3. There was an increase in learning outcomes from Cycle I to Cycle II using the Inquiry Learning Method.

### 4. CONCLUSION

Based on the results of research that lasted for two cycles, the following conclusions can be drawn:

1. The results of learning mathematics in Class XI Office Administration through the Inquiry Learning model in the first cycle was an average of 65 with a minimum score of 45 and a maximum of 80 with a 55.18% completeness percentage, while in the second cycle, the average score was 75.96 with a minimum score of 65 and a maximum score of 95 with a 93.10% completeness percentage.
2. Implementing learning with the Inquiry model from the first meeting to the last meeting was carried out well. This was indicated by the average implementation of learning in the first cycle, which was 3.53 to 3.58 in the second cycle.
3. There was a change in students' attitudes during the learning process in accordance with the results of observations, namely the application of the Inquiry learning method with an average percentage of student activity from Cycle 1, 49.19% to 75.17% in Cycle 2.
4. The number of students who responded positively "yes" to learning using the Inquiry learning method was 94%

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