Inquiry learning strategy to improve mathematics achievement of junior high school

E Siregar¹ and S R Siregar²
¹Universitas Negeri Medan
²SDN 117504 Perkebunan Aek Pamingke

E-mail: efiyantisiregar50@gmail.com

Abstract. The outline of this research issue is whether use of the learning strategies inquiry can improve the results of VII A graders of SMP Muhammadiyah 57 Medan T.P. 2016/2017, whether the use of learning strategies inquiry can improve learning activities of students of Class VII A graders of SMP Muhammadiyah 57 Medan T.P. 2016/2017. The research aims to find out how to increase the results of learning math grade VII A graders of SMP Muhammadiyah 57 Medan T.P. 2016/2017. This type of research is Research Action class (PTK). Instrument in the form of tests and Observation. The subject of research is the grade VII A VII A graders of SMP Muhammadiyah 57 Medan T.P., as many as 37 people. The object of his research is the use of inquiry learning strategies to increase student learning results SMP Muhammadiyah 57 Medan T.P. 2016/2017. On cycle I the percentage of student learning outcomes of 40.54% and an average student learning activities of 1.8 with criteria enough, in cycle II percentage of student learning outcomes the overall percentage of 51.37% and an average student learning activities amounting to 2.2 with criteria enough, in cycle III the percentage of student learning outcomes the overall percentage of 86.49% and average learning activities of students 2.7 with criteria good. Then it can be inferred that the student learning outcomes can be improved by using the learning strategy inquiry.

1. Introduction
Education is one of the important things that determine the development of a nation, then to produce qualified human resources capital required from the results of education itself. One effort that can be done by learning. Learning is the main activity in the process of education [1]. Learning is a change of behavior be good, where such changes occur through training or experience [2].

Mathematics is one of the science that is studied in the educational world. Mathematics has a role in supporting progress in other sciences, such as chemistry, physics, astronomy and more. So many problems in daily life that can be solved by math [3]. However, the lessons of mathematics has led to abstract nature of many students find it cumbersome and difficulties in learning mathematics and even most of the learners have a negative perception towards mathematics, such as lazy and students avoid math [4]. Therefore, it takes a real understanding of concepts in the study of mathematics. According to [5], to eliminate the bad perception of students toward mathematics, should begin from ourselves teachers.
Until this time learning math in school still dominated by conventional learning that is learning that its implementation in the form of lectures and teachers have the authority to explain learning material without engaging students in active, so students are only encouraged to memorize the whole explanation without the need to ask questions and even students are not encouraged to understand and apply the concepts and principles in solving problems encountered in the Community [6].

Teachers as educational professionals have an important role in the process of teaching and learning. Including how to learn math teachers to transfer their knowledge to the students as the main objective in the process of teaching and learning [7]. Every effort is made to make students understand about the knowledge and skills provided by their teachers so that students can solve their own problems in either mathematics or other lessons.

Based on the results of the initial observation conducted by researchers interviewed teachers study that of the 74 grade VII of SMP Muhammadiyah 57 Medan consists of two classes, namely Class VII A with as many as 37 students and VII B as many as 35 students and of the second class the visible results of their midterm exams that in Class VII A there are more students wrote not completely. So it can be concluded that the results of the study and the learning interest of students is very low.

The model of teaching that occurs in these classes are generally still use the lecture method of its activities involve more teachers so that students in the process of teaching and learning are more likely to be passive. It is therefore necessary the selection of the approach or the appropriate learning strategies to help teachers to be able to communicate well against their students, and can open diverse thinking insights from all students, so students can explore different concepts and ways of tying it in real life. One of them is the learning strategy of Inquiry. The purpose of the Inquiry learning is to develop the ability to think in intellectual ability, logical, systematic and critical or developed as part of the mental process [8]. According to [9] is a method of discovery learning encourages students to come to a conclusion based on their own observations and activities.

Based on the background, then the formulation of issues that will be examined in this study are: (1) whether the use of Inquiry learning strategies can improve the results of mathematics, and (2) whether the use of the Inquiry learning strategies can enhance math learning activities of students.

So the goal of the research is: (1) to find out how to increase the results of learning math after using Inquiry learning strategy, and (2) to determine whether the use of Inquiry learning strategies can increase the activity of learning math.

2. Method
This research was carried out in Class VII A SMP Muhammadiyah 57 Medan T.P. 2016/2017 which at once became the subject in this research as many as 37 students. That is where the time doing research on even-numbered Years Learning 2016/2017 even semester starting from January up to finish. And that became the object of this research is the application of Inquiry learning strategies to enhance student learning math results T.P. 2016/2017.

This type of research is research action class (classroom action research) and has 3 stages of the cycle. Classroom action research can be seen as a combination of practitioner Inquiry, teacher research, and technical action research, resembling a method of finding out what works best in an individual's specific context to improve student learning and also improve a teacher's teaching in their own classroom [10].

The first cycle consists of four phases, namely the first planning stages with some of the activities undertaken include: (1) Collaborate with teachers of Mathematics subjects in Class VII A, (2) make the RPP (plan The implementation of the study), (3) Preparing the material to be taught at a meeting of the learning, (4) Make the observation sheets teachers and students, (5) Make the question of the test cycle consisting of 5 question and answer keys. Then the second stage of implementation with the following activities: (1) Implement learning using Inquiry learning strategy with material Set in which researchers act as observer and collaborate with teachers eyes the lessons in the classroom, (2) Provide the test cycle I to students in learning activities to find out the results achieved after the giving of the action. The third is the stage of observation with the following activities: (1) do the observation
activities of the teacher to see the extent to which learning is done with teachers model used, (2) do the observation activities of the students to see how the large increase in the learning activities of students once used the Inquiry learning strategy. And the last is the reflection stage consists of several activities are: (1) analyze data observations, (2) evaluation, (3) analyze the results evaluation, (4) Implement advanced cycle if seen there are still weaknesses and yet the achievement indicators of success.

Then the second cycle is implemented based on the results of the reflection the cycle I by performing actions that aim to correct the deficiencies in the cycle I. cycle II on Activities also through the same stages as the cycle of the next cycle I. where on the third stage of the planning of the activities performed is to make learning plan based on the results of the second cycle of reflection with a view to fixing the flaws in cycle II. At this stage the researcher is also preparing to question the test descriptions as much as 5 reserved along with a key to the answer. Later stage, by implementing learning plans based on the results of the reflection on the cycle II. The third stage, namely the that do observations to determine whether there has been an increase in the motivation experienced by students after the improvement actions undertaken. And the last is a stage of reflection that drawing conclusions.

Implementation of the evaluation and assessment of the results of the study are important because the results of the study done as an expression and embodiment of the results of the implementation of learning [11]. According to [12], the results of the study are all skills and results achieved through the process of teaching and learning at the school expressed with numbers or values based on the test results of the study. To obtain the necessary data in this study used data collection tool that is a test of overall study and observation sheets. Then the data analysis techniques in the research of class act done in order to find out how big a success in research actions to repair the results of student learning. Making sense of data analysis is an ongoing process which is composed during and after data collection [13]. To analyze the data of observation do stages: (1) preparation, (2) Tabulate data, (3) the application of appropriate data with research approaches.

Observation sheet will be created with the score then the sum score calculated percentage is obtained using the formula:

\[ R = \frac{\text{The amount of the final value}}{\text{the number of observation}} \]

Further analysis of the results of observation of the management study, done with the stage determine the category of each activity, with criteria: 4 = excellent, 3 = good, 2 = sufficient, 1 = less, 0 = very less. Then the stage of calculating the average value of each of the categories and then compare the value of the category criteria the results of the assessment. As for the message is as follows:

- Average < 0.50 = Very Less
- 0.5 ≤ Average < 1.50 = Less
- 1.50 ≤ Average < 2.50 = Enough
- 2.50 ≤ Average < 3.50 = Good
- Average ≥ 3.5 = Very Good

To calculate the value of the test results obtained by each student used the following formula

\[ KB = \frac{T}{T_1} \times 100\% \]  \[1\]

with description: \( KB \) = overall of learn, \( T \) = total score obtained by students, \( T_1 \) = the total number score.

As for the criteria of overall student learning results per individual based on the KKM of SMP Muhammadiyah 57 Medan 2016/2017 i.e. amounted to 75. And to determine the overall of classical learning can be done by using the formula:

\[ KBK = \frac{\sum \text{sastery Learning students}}{\sum \text{students}} \times 100\% \]  \[2\]

A class is said to be complete if the percentage of classical achieved a minimum of 80%. After doing calculations or analyze quantitatively the next steps to be performed are: (1) reduction of data presentation, (2) presentation, (3) drawal of the conclusion, done by reading and analyzing, and
drawing conclusions about there whether or not improvements learn math through the use of Inquiry learning strategies on students of Class VII with SMP Muhammadiyah Medan T.P. 2016/2017.

3. Results and discussion

3.1. Early research findings description

To measure the ability of the early students were given preliminary tests. And obtained the following results in Table 1.

| Initial tests | Percentage |
|---------------|------------|
| Thoroughly    | 29.73%     |
| Not Completely| 70.27%     |

Then the results of these observations is presented in the overall diagram in Figure 1.

![Figure 1](image.png)

**Figure 1.** Diagram percentage results overall student learning on initial tests

The graph shows that student learning outcomes is still very low, namely only around 29.73% or about 11 students who have a learning outcome ≥ 75%.

3.2. Description Of The Implementation Cycle I

3.2.1. Implementation Cycle I

Observations or observational study results of students in the learning process in the cycle I still belong to very low. At the end of the meeting, students are given tests by as much as 5 reserved to know student learning outcomes as shown in Table 2.

| Cycle I | Thoroughly | Not Completely |
|---------|------------|----------------|
|         | 40.54%     | 59.46%         |

Then the results of the analysis are presented in the diagram overall study in Figure 2.

![Figure 2](image.png)

**Figure 2.** Diagram percentage of overall student learning Cycle I
The graph above shows that the percentage of overall student learning at the cycle I still low namely only 40.54%. And the percentage who do not completely achieve 59.46%. A descriptive analysis of the score test results grade VII A SMP Muhammadiyah 57 T.P. 2016/2017 at cycle I presented in Table 3.

**Table 3. The description of learning outcomes students score on cycle I**

| Statistics       | Value |
|------------------|-------|
| The Ideal Score  | 95    |
| Number of Population | 37 |
| Average          | 61.35 |
| The Maximum Score| 85    |
| The Minimum Score| 50    |

Then the following Observations of students ' learning activities are presented in Table 4.

**Table 4. The results of the observation activities of student learning cycle I**

| No | Aspects of Observation                                      | Total Score | Average | Description |
|----|-------------------------------------------------------------|-------------|---------|-------------|
| 1  | The readiness of students to attend lesson                 | 62          | 1.7     | Enough      |
| 2  | The attention of the students to the teacher when describing| 67          | 1.8     | Enough      |
| 3  | Student response to questions given by teachers             | 70          | 1.9     | Enough      |
| 4  | The liveliness of the students pay attention to the teacher in the learning activities | 67 | 1.8 | Enough |
| 5  | Students ' ability to conclude the matter described         | 68          | 1.8     | Enough      |

The total number of 344

Average 1.86

Then the results of the observations above are presented in Figure 3.

![Figure 3. Diagram percentage of learning activities of students cycle I](image)

Then based on teachers ' activities observation data cycle I gained score each aspect are presented in Table 5.
Table 5. The results of the observation activities of the teacher in the learning cycle I

| No | Part a assessed Aspects          | Score |
|----|---------------------------------|-------|
| I  | The Planning of Learning        | 4     |
| II | Implementation of The Learning | 2.5   |
| III| Implement The Evaluation        | 3     |
| IV | Closing Skills Learning         | 2.7   |
|    | The total number of             | 12.2  |
|    | Average                         | 3.05  |
|    | Description                     | Good  |

From the explanation above it can be concluded that teachers in carrying out activities of teaching on this cycle I get a good criteria. Although the results of the activity of the teachers are good but needs improvement so that more learning is held and students are learning to follow a more active learning strategies with the Inquiry so that it can improve the results of his studies as well.

3.2.2. Implementation Cycle II

Cycle II obtained the results of overall student learning as shown in Table 6.

Table 6. Percentage of the overall student learning cycle II

| Thoroughly | Not Completely |
|------------|---------------|
| 51.35 %    | 48.65 %       |

Then the results of these observations are presented in the diagram overall study in Figure 4.

Figure 4. Diagram percentage of overall student learning cycle II

The graph above shows that the percentage of overall increasing student learning that is reaching 51.35%. And the percentage who do not completely achieve 48.65%. A descriptive analysis of the score test results grade VII A SMP Muhammadiyah 57 T.P. 2016/2017 at cycle II is presented in Table 7.

Table 7. The description of learning outcomes students score on cycle II

| STATISTIC             | VALUE  |
|-----------------------|--------|
| The Ideal Score       | 100    |
| Number of Population  | 37     |
| Average               | 68.78  |
| The Maximum Score     | 95     |
| The Minimum Score     | 30     |
Then the following Observations of students’ learning activities are presented in Table 8.

**Table 8.** The results of the observation activities of student learning cycle I

| No | Aspects of Observation                                      | Total Score | Average | Description |
|----|-------------------------------------------------------------|-------------|---------|-------------|
| 1  | The readiness of students to attend lesson                 | 76          | 2.1     | Enough      |
| 2  | The attention of the students to the teacher when describing | 84          | 2.3     | Enough      |
| 3  | Student response to questions given by teachers            | 77          | 2.1     | Enough      |
| 4  | The liveliness of the students pay attention to the teacher in the learning activities | 81          | 2.2     | Enough      |
| 5  | Students’ ability to conclude the matter described         | 81          | 2.2     | Enough      |

The total number of 399

Average 2.2

Then the results of the observations above are presented in the following diagram in Figure 5.

![Diagram](image)

**Figure 5.** Diagram percentage of students learning activity cycle II

Then based on teachers’ activities observation data cycle II obtained score each aspect are presented in Table 9.

**Table 9.** The results of the observation activities of the teacher in the learning Cycle II

| No | Part a assessed Aspects       | Score |
|----|-------------------------------|-------|
| I  | The Planning of Learning      | 4     |
| II | Implementation of The Learning | 3.6   |
| III| Implement The Evaluation      | 4     |
| IV | Closing skills learning       | 3.3   |

The total number of 14.9

Average 3.73

Description Very Good

From the table above it can be concluded that teachers in carrying out the activities of the learning cycle II is categorized very well. Because every aspect of the start of planning, implementation, evaluation, skill learning closing gotten average rating criteria very well.

3.2.3. Implementation Cycle III

Cycle III obtained the results of overall student learning as shown in Table 10.
Table 10. Percentage of the study cycle overall III

| Thoroughly | Not Completely |
|------------|----------------|
| 86.49%     | 13.51%         |

Then the results of the observations above are presented in the form of the following diagram in Figure 6.

![Diagram percentage of overall student learning cycle III](image)

**Figure 6.** Diagram percentage of overall student learning cycle III

The graph above shows that the percentage of overall increasing student learning that is reaching 86.49%. And the percentage who do not completely achieve 13.51%. A descriptive analysis of the score test results grade VII A SMP Muhammadiyah 57 T.P. 2016/2017 at cycle III is presented in Table 11.

Table 11. The description of learning outcomes students score on cycle III

| STATISTIC       | VALUE |
|-----------------|-------|
| The Ideal Score | 100   |
| Number of Population | 37   |
| Average         | 80.81 |
| The Maximum Score | 95   |
| The Minimum Score | 60   |

Then the following Observations of students' learning activities are presented in Table 12.

Table 12. The results of the observation activities of student learning cycle III

| No | Aspects of Observation                                    | Total Score | Average | Description |
|----|-----------------------------------------------------------|-------------|---------|-------------|
| 1  | The readiness of students to attend lesson                | 100         | 2.7     | Good        |
| 2  | The attention of the students to the teacher when describing | 97          | 2.6     | Good        |
| 3  | Student response to questions given by teachers           | 99          | 2.7     | Good        |
| 4  | The liveliness of the students pay attention to the teacher in the learning activities | 101         | 2.7     | Good        |
| 5  | Students' ability to conclude the matter described        | 102         | 2.7     | Good        |
|    | The total number of                                       | 499         |         | Good Average|
|    | Average                                                   |             | 2.7     |             |
Then the results of the observations above are presented in the diagram in Figure 7.

Figure 7. Diagram percentage of learning activities of students cycle III

Then based on teachers' activities observation data cycle III obtained score each aspect are presented in Table 13.

Table 13. The results of the observation activities of the teacher in the learning cycle III

| No | Part assessed Aspects               | Score |
|----|-------------------------------------|-------|
| I  | The Planning Of Learning            | 4     |
| II | Implementation Of The Learning     | 3.9   |
| III | Implement The Evaluation            | 4     |
| IV | Closing skills learning             | 4     |
|    | The total number of                 | 15.9  |
|    | Average                             | 3.98  |
|    | Description                         | Very Good |

From the table above it can be concluded that teachers in carrying out the activities of the learning cycle III is categorized very well. Because every aspect of the start of planning, implementation, evaluation, skill learning closing gotten average 3.98 criteria very well.

3.3. Discussion of research results

The discussion that will be outlined in this research is the result of learning students after learning using Inquiry learning strategy increases and the granting of special value to students who are active in the learning process. One of the strategies of learning in math, which is still considered to be a fairly effective learning strategy is the Inquiry.

The grant action on cycle I for overcoming adversity experienced by students using Inquiry learning strategy, then given a test. Percentage of learning outcomes acquired 40.54% category prepared, and 59.46% categorized not completely by highest value is 85 and the lowest is 50. The average results obtained student was 61.35. Because of the level of overall in classical haven't reached 85% then this research continues to cycle II. Percentage of learning outcomes gained 51.35% categories has been completed, and 48.65% category not completely with the highest value is 95 and the lowest is 30. The average results obtained student was 68.78. Because of the level of overall in classical haven't reached 85% then this research continues to cycle III. Percentage of learning outcomes acquired 86.49% categories has been completed, and 13.51% categorized not completely with the highest is 95 value and the lowest is 60. The average results obtained student was 80.81. Because of the level of overall been fulfilled then the research did not proceed to next cycle or research is stopped until the cycle III only.

The results of research that I have done is also in line with the results of research conducted by Susanta (2013) under the title "application of Inkuiri Assisted Learning to improve the learning results
of Geoegebra Geometry for students Education University Of Bengkulu Mathematics " The study shows that the results of the student learning experience an increase in the ability of thought to understand the problem, take the initiative themselves to resolve problems and provide memory longer because through the checkout process more noted and so the study results Susanto (2013) under the title "Learning of trigonometric Inquiry on Materials to improve the results of learning and activity of Students of class X 2 SMA Negeri 1 Bengkulu City." The results showed with learning inquiry can improve the results of the study. Evidenced by an increase in the value of the average and overall learning outcomes each cycle. The mean value of the average students 72.5 on cycle I increased to 80.9 in cycle II. Cycle III the results of student learning increased to reach 87. While overall students can study in cycle I of 63.89% increase to 83.33% in cycle II and continue to rise cycles III reached 97.22%.

4. Conclusion
Using Inquiry learning strategy obtained an increase in student learning math results on the material Set on cycle I the average value obtained was 61.35 students with overall of classical 40.54% and cycle II the average being 68.78 with overall classical 51.35% and cycle III the average obtained 80.81 with overall classical 86.49% and on the results of the observation activities of student learning analysis results obtained an increase in indicators of student learning activities i.e. from an average 1.84 criteria enough in cycle I, then in cycle II obtained an average of 2.2 criteria enough, and the rise in cycle III with an average of 2.7 and got a good criteria. Thus the results of the evaluation cycle I, II, III is obtained that the number of students who experience difficulty or failure to learn math content Set has decreased the amount. Therefore we can conclude that with the use of learning strategies of Inquiry on the Set material in Class VII A SMP Muhammadiyah 57 T.P. 2016/2017 can improve the results of learning math students with effective.

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