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Application of accelerated learning method to improve the ability of students' mathematical representation

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ABSTRACT

One of the mathematical skills that must be possessed by students is the ability of mathematical representation, therefore the applied learning method should be able to facilitate the students to learn to represent the mathematical ability they have. The purpose of this study to determine the improvement of students' mathematical representation in mathematics learning using accelerated learning method. The research method used is Quasi Experiments with Nonequivalent (Pretest and Posttest) design of Control Group Design. The population in this study is the students of grade X in Pasundan Majalaya Senior High School by using Purposive Sampling technique. The samples involved in the study were 48 students of Pasundan Majalaya Senior High School, 24 students came from class X MIPA 1 (experimental class) and 24 students came from class X MIPA 3 (control class). The learning method is applied to the students of class X MIPA 1 is the method of accelerated learning whereas in the students of class X MIPA 3 is conventional methods. The result of mathematical

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representation of students 'mathematical representation shows that there is an improvement of ability for students' mathematical representation with gain value of 0.56 with middle criterion for class X MIPA 1 and 0.17 with lower criterion for class X MIPA 3.

***Keywords*:** Method of accelerated learning, mathematical representation, Quasi Experiments, purposive sampling

1. INTRODUCTION

Mathematics is one of the lessons taught in school. These mathematics subjects always get more attention than other subjects. Many parents assume that the subject of mathematics is the most important subject that must be owned by students. Moreover, coupled with the perception of some teachers who assume that the ability of students in mathematics will affect the ability in other fields of study, thus making mathematics has always been a superior subject.

But not all students have good skills in mathematics subjects. There are still some students who think that math lessons are a frightening lesson, so many of them avoid the lesson [20], [24]. That is one of the views that led to the lack of students' ability in the field of mathematics. Whereas learning mathematics requires students to have five basic mathematical skills, including: problem solving; reasoning and proofing; communication; connection; and representation [22].

The ability of mathematical representation is one of the mathematical abilities students must possess after learning mathematics, because using the correct mathematical representation will help students provide a more concrete mathematical idea [11]. Representations are expressions of mathematical ideas or ideas that are presented in an attempt to find a solution to the problem it faces [23]. Cay et al. [7], [25] view representation as a tool one uses to communicate the answers or mathematical ideas in question. In other words, representation is expressions of the mathematical idea that the student displays as a substitute for a problem situation that is used to find the solution of the problem he is facing as the interpretation of his mind. A problem can be represented through images, words (verbal), and mathematical symbols [1], [10], [12].

The ability of mathematical representation can assist students in building, understanding concepts and expressing mathematical ideas and facilitating students in developing their capabilities [13], [21], [28], [30]. This is in accordance with what Jones discloses [2] there are several reasons for the importance of representational ability, that is, in addition to the basic skills students have for building concepts and thinking mathematics, can also be used in problem solving. Therefore, the ability of mathematical representation is very important to be developed. But in reality these capabilities have not developed to the fullest. This is in accordance with a preliminary study conducted by the author through interviews to one of the mathematics teachers and giving questions with indicators of mathematical representation capabilities taken from the thesis to students at Pasundan Majalaya Senior High School.

The results of the preliminary study show that students still have difficulty in describing, modeling or formulating, and writing steps in solving mathematical problems with their own language. One of the causes of the low ability of students' mathematical representation in the school is the method of learning that is done is still one way, in other

words the implementation of learning is done by way of lectures and giving questions. This happens because some teachers are still difficult to facilitate students with interesting learning, motivate students in learning mathematics, and provide opportunities for students to present the ability that can improve the ability of mathematical representation so that students not only imitate the steps given by teachers in solving mathematical problems. In order to overcome these problems, it needs a creative and innovative method so as to motivate students' learning, so that learning is more meaningful, students are more active, and able to explore their capabilities.

Innovative learning began to evolve according to the times, many learning methods developed by experts to create an active learning atmosphere through student centered approach one of the methods is the accelerated learning method [19]. Colin [4] states that accelerated learning is the process of absorbing and understanding new information quickly, and mastering that information. In the process of accelerated learning students are actively involved in achieving acceleration in recognizing and mastering the mathematical concepts being taught. One of the principles of accelerated learning is to support positive emotions, so that students can learn actively and in a state that is not depressed.

In line with the learning process using accelerated learning method students learn in a state of relaxed, confident, and motivated so it can be assumed that with the confidence of students will be accustomed in modeling, formulating, and solving problems using his own language [29]. In other words, accelerated learning method can improve students' mathematical representation ability. Therefore, in this study, the application of accelerated learning method was used to improve the ability of students' mathematical representation.

2. METHODOLOGY

Table 1. Gain Criteria Normalized

Gain Normalized	Criteria
$g \leq 0{,}30$	Lower
$0.30 < g \leq 0.70$	Middle
$g > 0.70$	High

This research was conducted in Pasundan Majalaya Senior High School. The population selected in this study is all students of class X in Pasundan Majalaya Senior High School, by way of sampling class using purposive sampling technique [14]. From a class X that has a homogeneous ability and a low mathematical representation capability, two classes are used. In this research, that is: class X MIPA 1 which used as experiment class and X MIPA 3 become control class. The data of students' mathematical representation is derived from the value of pretest and posttest result on the ability of mathematical representation. The method to be used in this research is quasi-experimental method [3], [9]. To know the improvement of

the mathematical representation ability of the students who obtained the learning using accelerated learning method and conventional method, a normalized gain analysis was performed using equations 1 [5], [6], [8], [15-17], [27].

$$g = \frac{Skor_{post\ test} - Skor_{pretest}}{Skor_{maximal} - Skor_{pretest}} \quad (1)$$

The normalized gain categories are interpreted in Table 1 [16], [17]

3. RESULT AND DISCUSSION

3. 1. Overview of Learning Process

Description Implementation of learning process with accelerated learning method applied in class X MIPA 1 is as follows:

a) Preliminary Activities

Before the learning takes place, the students prepare in advance to pray, be conditioned to learn, and sit in groups according to the group division at the previous meeting and each group gets SAS (Student Activity Sheet). After that the students are reminded of the elements in the three dimensional space through several pictures of objects in everyday life, as in Figure 1.

Figure 1. Images of Three Dimensions

Based on Figure 1, students are reminded of the shape of the given images, as well as the elements in the image. Because it is related to the position between elements of building space. Students look enthusiastic when shown the pictures, even some students there who mentions other objects that are the three dimensions. After that, the teacher conveys the learning objectives to be achieved and the activities that the student should do during the learning process. Then the students are asked to make positive suggestions in the form of

words like "We are ready to learn math" and say it aloud (Motivating). When expressing positive suggestions, students are seen to be in a hurry. This is because students are not familiar with the methods used.

b) Core Activity

At the delivery stage students are given an idea of the importance of the material to be studied. Through the description given can attract students' curiosity so that students are enthusiastic in following the learning process to find out the meaning of the material to be studied (Acquire). One of the images given at the first meeting is two railroads as shown in Figure 2.

Figure 2. Overview provided about Benefit Lesson learned

Why can two trains run on both rails at the same time? What is the position of both rails? If the position is changed, can two trains run at the same time?

Figure 3. Student activity describes Point Position, Line, and Field

Based on above description, it makes students think and they will find out the answer of the given problem. After that, students are guided to actively engage in group discussions in

constructing point, line and field positions by doing SAS (Search out the Meaning). In constructing the position of point, line and field on activity 1 to activity 3, the overall student finds no difficulty, because in activity 1 to activity 3 the student simply demonstrates the guidance in the SAS then describes the condition of the presentation and describes it in its own language looks like in Figure 3.

After students are able to construct positions of dots, lines, and fields in three dimensional spaces, the next stage is the training stage where each group is asked to make the problem and then exchange the problem with another group and work on the problems they get from other groups.

At this meeting the exchange of problems is determined by the teacher, i.e. the problem of group 1 is exchanged with group 2, group 3 is exchanged with group 4, etc. This activity can be seen in Figure 4 and Figure 5. In this activity takes a long time, because students are not used to make the problems in accordance with the indicators given and the condition of the class to be a little rowdy, but the noise subsided after they get problems from other groups (Search Out the Meaning).

Figure 4. Student Activity When Redeeming Problems Made by Them

Figure 5. Student Activity When Resolving Problems They Get from Other Groups

The next stage is the performance stage of the results, before asking the students to present the results of the discussion as shown in Figure 6 all the problems obtained by each group are collected first, then the group who get interesting questions are asked to present the results of the discussion in front of the class and the other group respond. At this stage the students still look nervous about the result of their discussion about the position between the elements of waking up, and there are still groups who look scared when asked to respond to the results of the discussions of the other groups (Exhibit What You Know)

After that, students are asked to make a summary relating to the position between the elements of building the space (Triggering). As time passes and input from the observer, student activity increases at the next meeting. This can be seen from the improvement of the students' activity in each meeting.

Figure 6. Student Activity Presenting Results of Group Discussion

c) Closing Activity

Before the lesson is closed, shown in Figure 7 at the end of the lesson, the teacher with the students draws conclusions from the learning that has been done, evaluates the process and the learning outcomes, reflects, then gives the quiz problem with the remaining time, at the time the quiz question cannot be solved insufficient time for the next meeting. In addition, students are reminded to learn the next meeting material in the teaching materials.

Figure 7. Learning Reflection Activity

3. 2. Improvement of Student Mathematical Representation Ability

To find out the average score of mathematical representation test score of students can use equation 1 and descriptively can be seen in Table 2 and Figure 8.

Table 2. Ability improvement of Mathematical Representation**.**

Class	Ideal Score	Mathematical Representation			Criteria
		Average Pretest	Average *Posttest*	Average *Gain*	
X MIPA 1	100	27.00	66.83	0.56	Middle
X MIPA 3		26.25	39.67	0.17	Lower

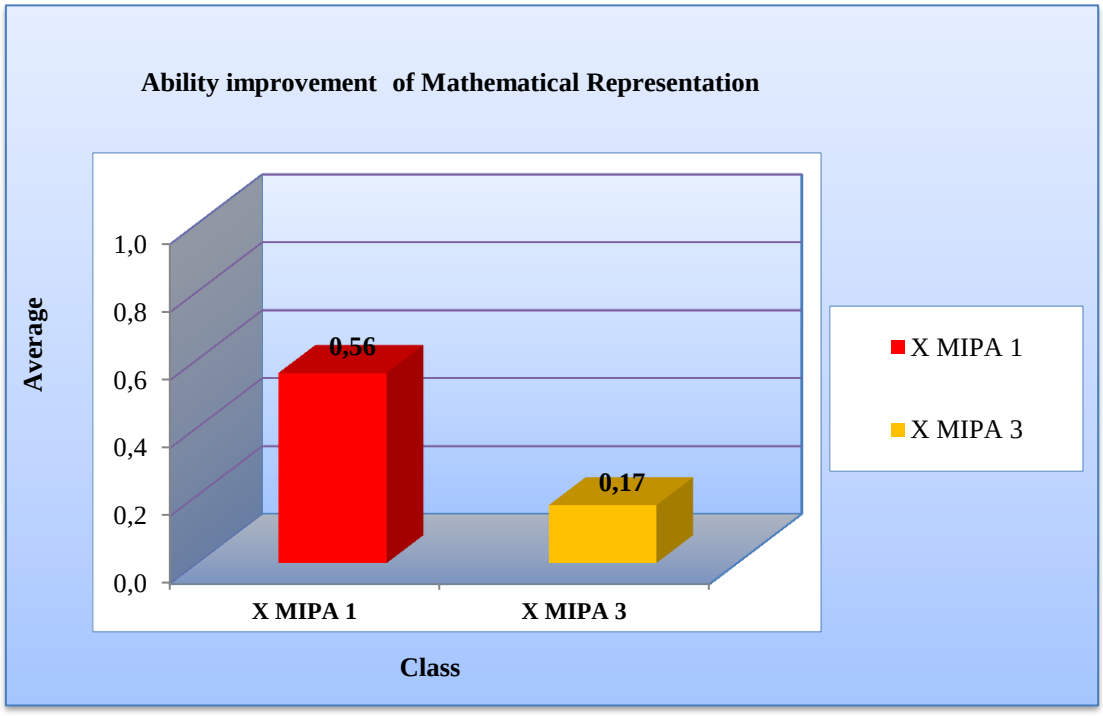

Figure 8. Average Gain Value

From Table 3.1 and Figure 3.8 it can be seen that the students' mathematical representation ability has increased, whereas the average increase of mathematical representation score of class X MIPA 1 is higher than the score of mathematical representation of class X MIPA 3. The mean of N-gain grade X MIPA 1 is included in the middle category of 0.56. While for the average value of N-gain class X MIPA 3 included in the low category that is 0.17. To find out the improvement of the mathematical representation of each student from the three classes, it can be seen in Figure 9.

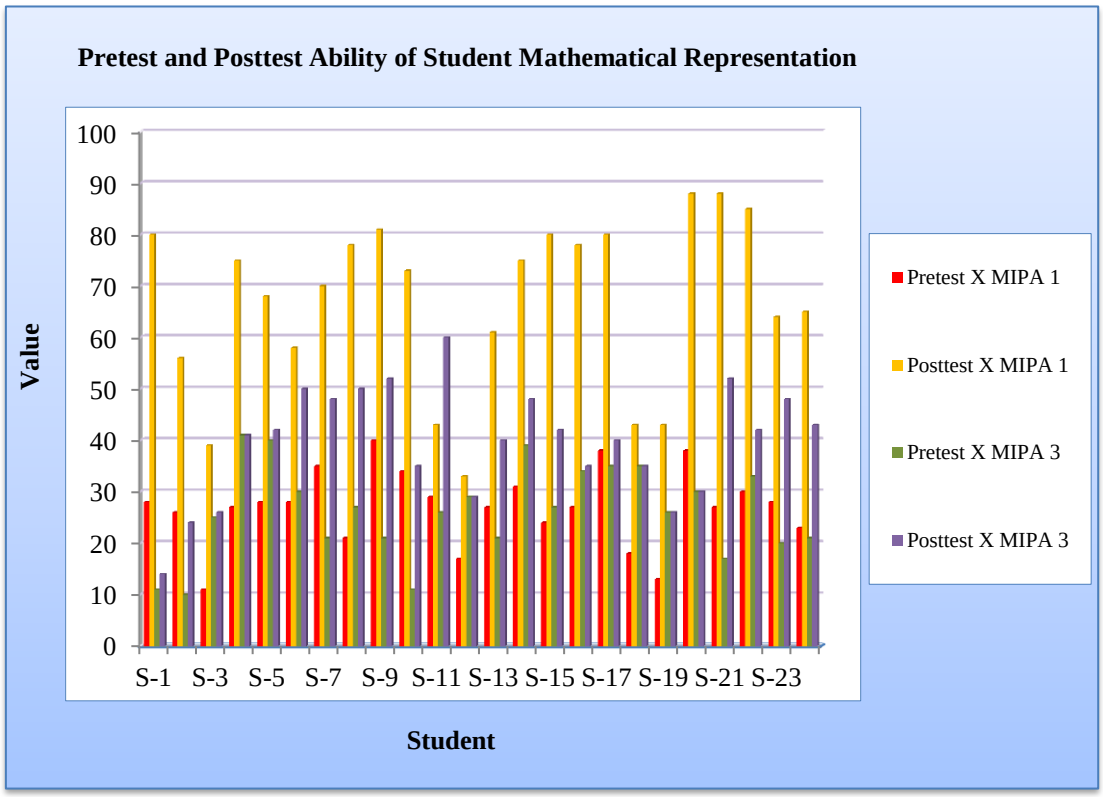

Figure 9. Improvement Chart of Student Mathematical Representation Ability

4. CONCLUSION

Based on the results of research and discussion that have been described in the previous section, obtained the conclusion that the ability of mathematical representation of students in grade X in Pasundan Majalaya Senior High School increased by using the accelerated learning method. The conclusion of the results of this study are as follows: there is an increase in the ability of mathematical representation of students after obtaining learning using accelerated learning method with the submission of problems from students, accelerated learning method with the submission of problems from teachers, and conventional methods. The criteria of gain value for the class using accelerated learning method with the application of problems from students and accelerated learning method with the submission of problems from the teacher included into the middle category, where the gain for the class using the accelerated learning method with the application of problems from students is 0.56 and gain value for the class that used the conventional method is 0.17 which fall into the lower category.

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