The influence of mathematics learning using SAVI approach on junior high school students’ mathematical modelling ability

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Abstract. The aim of this research was to examine mathematical modeling ability who learn mathematics by using SAVI approach. This research was a quasi-experimental research with non-equivalent control group designed by using purposive sampling technique. The population of this research was the state junior high school students in Lembang while the sample consisted of two class at 8th grade. The instrument used in this research was mathematical modeling ability. Data analysis of this research was conducted by using SPSS 20 by Windows. The result showed that students’ ability of mathematical modeling who learn mathematics by using SAVI approach was better than students’ ability of mathematical modeling who learn mathematics using conventional learning.

1. Introduction
School is an educational institution which gives a conducive space for the individual to acquire education. Producing good human resources, an educational institution must facilitate students to explore their skill and support them in having life skill. Syaodih (Turmudi & Yakub) stated that the benefits of education are to help students in developing all of potential, competent, and improve their personal characteristics in a positive direction, both within themselves and their surroundings [1]. So in the process of learning needs to be considered various aspects so that students’ development can be achieved well.

Tata argues that improving students’ mathematical modeling abilities is an effort to improve students’ ability to problem-solving through enclose modeling as a part of mathematics learning process [2]. Mathematical modeling is used in math word problems. The students are asked to formulate real problems into mathematical modeling which students then look for such solutions using mathematical modeling. However, not all students can easily understand mathematical modeling [3]. Crouch & Haines stated that the difficulty aspect of students in modeling is the interface between real-world problems and mathematical models, that is the transition from the real world problems to the mathematical model and the transition from mathematical model to the real world.[3] While the results of the application do not indicate a particular difficulty for students to stage the modeling process.

The preliminary study revealed that students have difficulty in formulating problems in everyday life into mathematical models, such as interpreting the real problem context into mathematical modeling,
understanding the structure of mathematics (including regularity, connection, and pattern) in problem [4]. Parlaungan stated that the students’ failure in modelling can be caused by the failure of students to understand (identify) the problem, inability to transform the real problem to mathematical modelling, ignorance of the underlying mathematical concepts toward modelling, inability to relate data with mathematical principles and inability to solve the given mathematical model [3].

Many causal factors make students’ mathematical modeling abilities are low. One other thing is the habit of learning students in school. In learning of mathematics, many students know mathematics but cannot understand mathematics concept, students prefer work mathematics in mathematical modeling with calculation mathematics only, and student not trying to understand the means of that mathematical modeling. Furthermore, finding the final solution is the main purpose of students in learning mathematics and ignore the process to find the mathematical modeling.

Ebutt & Strakker argue that to make the potential of students are develop and optimize in mathematics, assumptions about the characteristics of the students are given include: (1) students can learn mathematics if they have motivation; 2) students learn with their style; 3) Students learn mathematics with themselves or teamwork with their friends [5]. One of learning which makes develop the potential of students and learns mathematics optimally with involving learning style is learning mathematics with SAVI approach.

Learning with SAVI approach is learning which involve learning style who have students. Acronym of SAVI is somatic, auditory, visual, intellectual. The principal of SAVI approach is students active in physical activity or intellectual activity in the learning process. Furthermore, SAVI approach is followed modern cognitive science which argues that the best of learning is involve emotion, all of the body, all of the sense, grace other learning styles with consciously that everybody learns with their ways [6].

Meier stated that students can improve the ability to express their idea (Intellectual) if they are move something (Somatic) to produce pictorial, diagram, graphics, and others (Visual) while discussing what they doing (Auditory) [7]. The activity of SAVI approach in this study is: somatic learning is learning with involving move their body, active learning can facility student somatic cause in active learning the student acquitted to move their body in learning. Auditory learning is learning with involve the sense of hearing, the students discuss with their group and listen to the result of discussion other groups. Visual learning is learning with involve the sense of vision, the student makes mathematical modeling by pictures and make mind map in the end of learning to make light of students construct their knowledge. intellectual learning is learning to solve problems of mathematical modeling.

Based on the study has been described previously, SAVI approach can influence students’ ability to mathematical modeling. Study on the improvement of students’ ability of mathematical modeling has done. The result of study was then written in the form of report title the article “The Influence of Mathematics Learning Using SAVI Approach to Students’ Ability of Mathematical Modelling at Junior High School”

2. Methods

This study is designed in the form of experiment with the design of nonequivalent control group which part of the quasi experiment. The sample in this study was not randomly selected but classes by using existing classes. The experimental class was treated SAVI approach (SA) and the class is given control of conventional learning (CL). Before the study was held, the researcher did documentation observation in the class were treated SAVI approach and class were tread conventional learning to find out the similarity of students’ ability both. After the study is completed the final test is held (O), which test the students’ ability of mathematical modeling (AMM).

The instrument used in this study is the ability of mathematical modeling test. The mathematical modeling test is a test that aims to measure the students’ ability to mathematical modeling. Mathematical modeling is abilities that include the ability to perform the structuring, mathematization, solving, interpreting, validating.

This study is performed in junior high school students in Lembang, West Bandung, West Java Province, Indonesia. Population in this study is eighth-grade students in junior high school in Lembang.
The sample is taken in two class which chosen with purposive technique. Sampling with purposive technique is technique sampling which based on certain consideration [8]. The Consideration sampling in this study is characteristics and capabilities of class equivalent. To decided that class has characteristics and capabilities equivalent, the researcher get information based on teacher who teaches in school of research.

3. Result and Discussion
Based on the data analysis, the students’ ability of mathematical modeling which given treated SAVI approach is better than the students’ ability of mathematical modeling which given treated conventional learning. It seen from statistic test, it indicates that students’ ability to mathematical modeling in SA and CL is different significant.

Documentation studies done to determine the quality of mathematical prior knowledge students have prior to this study and to see equivalent samples. Documentation studies data source by data middle semester test (MST). The average value of MST shown in Table 1.

Table 1. Average Value of MST for Class SA and Class CL

| Type of Ability        | Experiments (n = 38) | Control (n = 40) |
|------------------------|----------------------|------------------|
| The average MST value ($\bar{x}$) | 47.05                | 52.83            |
| Standard deviation ($s$) | 16.86                | 16.57            |
| Ideal maximum Score    | 100                  | 100              |

Based on Table 1 average value of MST for class SA and class CL, SA score average is 47.05 and CL score average 52.83. The standard deviation of SA is 16.86 and 16.57. Despite average in SA and CL is different, but then given the similarity of the two test results mean MST between the two groups shows no difference in average values of MST between the two groups at the 0.05 significance level.

Table 2. Average Value of AMM for Class SA and Class CL

| Type of Ability        | SA (n = 38) | CL (n = 40) |
|------------------------|-------------|-------------|
| The average AMM value ($\bar{x}$) | 69.37       | 63.78       |
| Standard deviation ($s$) | 9.67        | 11.18       |
| Ideal maximum Score    | 100         | 100         |

Based on Table 2 average value of AMM for class SA and class CL shows that scoring average SA is 69.37 and score average CL is 63.78. The standard deviation of SA is 9.76 and standard deviation of CL is 11.18. The fact shows that data CL more spread that data SA. The average between two groups shows that average value of AMM in class SA higher than the average value of AMM in class CL. Based on average value which obtains in description of statistic, it shows that AMM in class SA is better than AMM in class CL.

Table 3. Result of Treatment Value Average of AMM

| t-test for Equality of Means | 95% Confidence Interval of the Difference |
|-----------------------------|------------------------------------------|
| t                          | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | Lower Mean Difference | Upper Mean Difference |
| Data Equal variances assumed | 2,358 | 76 | .021 | 5,593 | 2,372 | .868 | 10,319 |
Thus, the result of similarity of the two test results means AMM shows that there is a different average values AMM between two groups at the 0.05 significance level. It showed that result of significant value in the similarity of the two test results mean AMM is 0.021, it less than the significance level, 0.05. It means that AMM in class SA is better than AMM in class CL.

After the study about students’ ability of mathematical modeling has done, the researcher found some particular difficulty for students to learn the mathematical modeling. Students difficulty to determine the concept of mathematics that used to solve the problem in real-world context. Students are still difficult to perform counting operations, there are students who are still confused do the multiplication of decimal numbers, this resulted in fewer students mastering the stage in doing mathematical modeling is the stage of solving. Another difficulty is changing the solution of a mathematical problem into a real-world problem-solving. This can be seen from the exercise of the problem and the result of the test post that is done, in the solving stage the students do not experience difficulties, but in the interpreting stage, many students experience errors. Students’ habits do math problems solely on the solving stage, solving mathematical problems with math, making it difficult for students to interpret the numbers they can. What's more, the math problems that students normally use do not use real-world contexts. As a result mathematics and the real world as separate, whereas the emergence of mathematics because of a problem in the real world which is then solved by using mathematics and translated back as a solution in the real world.

4. Conclusion
Based on the result and discussion, it can be concluded that students’ ability of mathematical modeling who acquire mathematics using SAVI approach is better than using conventional class.

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