Improving the Mathematical Representation and Self Confidence through Realistic Mathematics Education Approach for Junior High School

[1]Nani Suryani, [2]M. Ikhsan and [3]Marwan

[1]Master Program in Mathematics Education, Faculty of Teacher Training and Education, Syiah Kuala University, Darussalam, Banda Aceh, Indonesia
[2]Faculty of Teacher Training and Education, Syiah Kuala University, Darussalam, Banda Aceh, Indonesia
[3]Faculty of Mathematics and Natural Sciences, Syiah Kuala University, Darussalam, Banda Aceh, Indonesia

[*]*Corresponding author*: nani080293@gmail.com

Abstract

Mathematical representation ability is one of the skills that students need to have in the 2013 curriculum learning and self-confidence is one of the psychological aspects that students need to have in the 2013 curriculum learning. The low ability of mathematical representation and confidence of students shows the need for improvement efforts in the implementation of mathematics learning, these efforts made by applying the approach of Realistic Mathematics Education. The purpose of this study was to determine the increase in the ability of mathematical representation and self-confidence of students through a realistic mathematics education approach. The type of this research is experimental research with quantitative approach. The research design used in this research is True Experimental Design with pre-test and post-test control group design. The population in this study were all students of class VII Junior High School, with two class samples of class VII-4 as the experimental class and class VII-5 as control class obtained by random sampling. The research instrument used was a mathematical representation ability test and a student confidence questionnaire — data analysis performed by finding N-Gain value, normality test, homogeneity test, and t-test based on students' initial and final ability. The results showed that there was an increase in the ability of mathematical representation and self-confidence of students through a realistic mathematics education approach.

Keywords: ability of mathematical representation, self-confidence, realistic mathematics education approach.

Introduction

One of the measurable goals in the curriculum 2013 (Permendikbud, 2014) is to understand the mathematical concept which is the competence in explaining linkages between concepts and algorithms flexibly, accurately, efficiently and appropriately in problem-solving. One of the indicators of achievement of these competencies is to present the idea in various forms of mathematical representation in the shape of tables, graphs, diagrams, drawings, sketches, mathematical models, or other means.

According to NCTM (2000), representation is the translation of a problem or idea in a new form, including the image or physical model into the shape of symbols, words or sentences. Dahlan (2011) states that representation is the basis or foundation of how a student can understand and use mathematical ideas. Representation deals with two things, namely processes and products.

Besides, the representation ability of students, is generally, still low. Based on the research of Sulastri (2017) the mathematical representation ability of class VII-2 students who are highly capable and are fulfilling three indicators of mathematical representation ability are presenting data or information from a problem to a table representation, solving problems involving mathematical expression and writing steps to solve mathematical problems with words. While those with low abilities are only two indicators, namely solving problems that require mathematical expression and writing steps to solve mathematical problems with words, Murni (2013) also states that students are not accustomed to answering questions arranged in story form. Also, the obstacles that also arise are the low ability of class VII students to use symbols/variables to serve what informed of the problems faced. These findings indicate that the ability to represent students on indicators makes the symbolic representation of s arranged in verbal form still low. Likewise, with the initial study of researchers that the representation skills of students are still low, students have not been able to construct ideas in problem-solving, especially changing questions in the form of descriptions into the shape of diagrams/drawings or mathematical expressions/symbols.

In addition to mathematical abilities, psychological aspects need in learning mathematics in the 2013 curriculum. The psychological aspect is the students' self-confidence. Psychological aspects are self-confidence students. Self-confidence is an aspect that is quite influential in student success because self-confidence is itself a confidence in carrying out tasks and choosing a method that is good, appropriate and effective. Surya (2007) states that this self-confidence becomes an important part of the development of the child's personality, as a determinant of how a person behaves and behaves.

One alternative to improve the ability of mathematical representation and self-confidence of students is through a realistic mathematical approach. According to Hadi (2017), the method of practical mathematics is a promising approach to learning mathematics. One of the learning principles of realistic mathematics approach is to use vertical instruments such as models, schemes, diagrams, and symbols (use models, bridging by the vertical tool). The term model relates to situations and mathematical self-developed models, which are the bridges for students to make their models from real cases to abstracts or from informal to formal situations. It means that students create their models in solving contextual problems which are the interrelationships between real-world situational models that are relevant to the student environment into the mathematical model. Therefore, the process of horizontal mathematization can lead to vertical mathematization (Freudenthal, 1991).

Based on the above description, the researcher conducted a study entitled "Improving Ability of Mathematical Representation and Self Confidence of Junior High School Students through Realistic Mathematics Education Approach."

Research Methods

This type of research was experimental research with the quantitative approach. The research design used was True Experimental Design with pretest and posttest control group design. In this design, researchers took two classes that gave different

treatments, namely the experimental class was given treatment, while the control class was not given treatment.

The population in this study is all students of class VII consisting of 5 classes. Then from the population selected two classes of class VII as a sample, a sampling technique conducted in this study is a random sampling. Random selection is made so that all classes get equal opportunity to be selected as a sample class. The sample in this research is class VII-1 and class VII-2.

The instrument used in this study is a test question to measure students' mathematical representation abilities, test questions made based on indicators of mathematical representation ability and aspects of RME approaches. The indicator of the ability of mathematical representation is to restate data or information in table form, solving problems involving mathematical expressions and answering questions using words or written text. Student self-confidence instruments are questionnaires totaling 30 items with positive and negative statements self-confidence indicators, namely confidence, optimism, objectivity, responsibility and realistic. Then the data obtained from the results of the tests were analyzed to determine the validity, reliability, differentiation, level of difficulty, N-Gain value, normality test, homogeneity test, and t-test based on students' initial and final ability.

Results and Discussion

Preliminary Ability Analysis Mathematical Representation

The score of pretest result of mathematical representation of students obtained before classroom learning with the experimental class and Control class as in table 1.

Table 1. The result of pretest from the experimental class and control class

Class	Number of Students	Ideal Score	Pretest Score			
			x_{min}	x_{max}	$\bar{x}$	S
Experimental	21	16	6	11	9,0	1,84
Control	21		6	11	8,3	1,67

Table 1 shows that the average pretest grade results with the experimental class and the control class have differences. The average pretest grade with the experimental class is higher than the average in the control class.

The Mean Equivalence Test the Average

Average equality test is done to test whether there is a difference in the significance of the initial ability between the experimental class and the control class. In summary, the average equality test can be seen in table 2.

Table 2. The results of equation test average pretest score ability mathematical representation of the experimental class and control class

	t	Asymp. Sig. (2-tailed)	Conclusion	Information
Experimental Class and Control Class	1,462	0,152	H_0 Accepted	No Differences

Table 2 shows value significance of student's mathematical representation ability that is 0,152 because Asymp.sig = 0,152 > 0,05, then H_0 is accepted, so H_a is rejected. It can be concluded that there is no significant difference between the experimental class and the control class.

Analysis of Improved Ability of Mathematical Representation

For the average N-gain, the ability of the mathematical representation of the two classes can be seen in table 3.

Table 3. Score of N-Gain Mathematical Representation Ability

Class	Mean	Standard Deviation	N
Experimental	0,321	0,458	21
Control	0,123	0,337	21

Based on table 3 above it is concluded that the average score N-gain of mathematical representation ability between experimental class and control class is classified into the medium and low category.

Average Difference Test: The Mean

Difference test was performed to test whether there was a significant difference between the experimental class and control class. In summary, the average difference test N-gain can be seen in table 4.

Table 4. Test results difference average score n-gain ability mathematical representation of experimental class and control class

	t	Asymp. Sig. (2-tailed)	Conclusion	Information
Experimental Class and Control Class	1,253	0,021	H_0 Rejected	Differences

Table 4 shows that the significance value of students' mathematical representation is 0,021 because Asymp.sig = 0,021 < 0,05, then H_0 is rejected, so H_a is accepted. It can be concluded that the improvement of mathematical representation ability of class students with experimental class is better than the control class.

Analysis of Students' Initial Self Confidence

Score questionnaire results of students' initial self-confidence between experimental class and control class. Based on the treatment of initial self-confidence score, the minimum score (x_{min}), maxithe mum score (x_{maks}), average score $(\bar{x})$ and standard deviation (S) as shown in table 5.

Table 5. Scale result of initial self-confidence from the experimental class and control class

Class	Number of Students	Ideal Score	Initial Score			
			x_{min}	x_{max}	$\bar{x}$	S
Experimental	21	16	73	91	80,14	5,01
Control	21		57	96	80,19	6,00

Table 5 shows that the average of control class results is better that is 0,05 from the grade average with experimental class, whereas for the standard deviation is obtained 5,01 for the experimental class and 9,00 for the control class. The results of the scale questionnaire can be in the experimental class, and the control class is not much different. The experimental class obtains an average of 80,14 while the control class obtains 80,19. It shows that the two standards have almost the same view of mathematics.

The Mean Equivalence Test: The Average

Equality test is performed to test whether there is a significant difference between the scales self-confidence initial with the experimental class and the control class. In summary, the average initial scale of self-confidence equation test can be seen in table 6.

Table 6. Average equivalence test result of students' initial self-confidence in the experimental class and control class

	t	**Asymp. Sig. (2-tailed)**	**Conclusion**	**Information**
Experimental Class and Control Class	-0,21	0,983	H_0 Accepted	No Differences

From table 6, it has been obtained that the value of significance of self-confidence students is 0,983 because Asymp.sig = 0,983 > 0,05, then H_0 is accepted, so H_a is rejected. It can be concluded that there is no significant difference between the initial of self-confidence of the experimental class and control class.

Analysis of Improvement in Students' Self Confidence

For average N-gain self-confidence of both classes can be seen in table 7.

Table 7. Score of N-Gain Self-Confidence

Class	**Mean**	**Standard Deviation**	**N**
Experimental	0,045	0,808	21
Control	0,030	0,225	21

Based on table 7 above it is concluded that the average score N-gain self-confidence in the experimental class and control class is classified into the medium and low category.

Average Difference Test: The Average

Difference test was performed to test whether there is a significant difference between self-confidence with an experimental class and control class. In summary, the average difference test of self-confidence can be seen in table 8.

Table 8. Test results difference average score of n-gain of students' self-confidence in the experimental class and control class

	t	**Asymp. Sig. (2-tailed)**	**Conclusion**	**Information**
Experimental Class and Control Class	-0,229	0,028	H_0 Rejected	Differences

From table 8, It is Obtained the signature of self-confidence of students is 0,028 because Asymp.sig = 0,028 < 0,05, then H_0 is rejected, so H_a is accepted. It can be concluded that the increase of self-confidence students with experimental class is better than the control class.

Conclusion

Based on the research, it can be concluded that the improvement of mathematical representation ability and self-confidence of students who get the learning with the experimental class is better than those that get the control class learning.

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