



Analysis The Ability of Students Mathematical Literacy on The Realistic Mathematic Education Learning with The Loads of The Character of Islam

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Abstract

The ability of students mathematical literacy (KLM) in MTs is still low because problems related to daily life are not used as the source of concept formation. The purpose of this study was to find out whether the Realistic Mathematic Education (RME) learning with character of Islam effectively improves students KLM and analyzed. Type of research used mixed methods with concurrent embedded research design with two types of data. Quantitative data are the value KLM in pretest and posttest which is analysed by ttest, gaintest and qualitative through three procedures namely reduction, presentation and conclusion. The two classroom research subjects are experiment and expository. The result of this research experiment is effective, because (1) experiment KLM has reached classical completeness exceeding 75%; (2) improvement of student KLM on experiment higher than student expository. The ability of students mathematical literacy on the category is very good, good and good enough.

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INTRODUCTION

Mathematics is one of the basic science that must be mastered by humans, especially by students in order to prepare to face problems in the real world (Septianawati, 2013). The students must have the ability of mathematical literacy to be useful. In relation to literacy, De Lange (2006) mentions that the word literacy is related to the "real" problem, that is a problem that is not "purely" mathematics. This is also in line with education in Japan that the concept of mathematical literacy is the goal of giving mathematics education (Nagasaki, 2015). The ability of mathematical literacy is also defined as the ability to understand and apply basic knowledge of mathematics in everyday life (Wong, 2005; Ojose, 2011).

The Program for International Student Assessment (PISA) defines mathematical literacy as a person's ability to formulate, apply, and interpret mathematics in a variety of contexts, including the ability to do mathematical reasoning and use concepts, procedures, and facts to describe, explain, or predict events (OECD, 2016; Stacey, 2011). However, according to Wardono & Kurniasih (2015), the ability of Indonesian students to solve problems that require the ability to analyze, reason, communicate effectively, and solve and interpret problems in various situations is still very low. Whereas, the ability to examine, reason, communicate, solve and interpret problems is the part of the ability of mathematical literacy. According to Wardhani & Rumiati (2011: 15) to transform the principles of mathematical literacy there are three major components identified in the PISA study, namely content, process and context.

The Organization for Economic Cooperation and Development (OECD) in the PISA study in 2012 stated that Indonesia was ranked 64th out of 65 countries participating in PISA (OECD, 2012). Meanwhile, by 2015, Indonesia was still ranked 56 out of 65 PISA participating countries in the ability to calculate,

read and science (OECD, 2015). Indonesia's achievement has indeed increased, but the result of PISA remains showing the low quality of education in Indonesia. It may be caused by the Indonesian students who are less accustomed and trained with any exercises PISA applied that require the ability of mathematical literacy in their solution.

The results of the study of the United Nations Development Program (UNDP) in 2014 on Human Development Index (HDI) show that Indonesia was in the 110th position out of 187 countries worldwide (UNDP, 2014). Meanwhile, the results of the Trends in International Mathematics and Science Study (TIMSS) study show that Indonesian students are ranked very low in ability (1) to understand complex information, (2) theory, analysis and problem solving, (3) use of tools, procedures and solutions problems and (4) conduct an investigation (Kemendiknas, 2013). The low international study results show that in particular, the reading comprehension of Indonesian students is low.

The deterioration of education in Indonesia now requires a lot of character education. The character education is getting considerable attention by the Indonesian government. It is even also clarified through the Law No. 20 of 2003 on the National Education System which reads "National Education functions to develop the ability and forms the character and civilization of dignified nation in order to educate the nation's life, aims to the development of potential learners to become human beings who believe and cautious to God Almighty, have a noble character, healthy, knowledgeable, capable, creative, independent, and become a democratic and responsible citizen" (Jubirman, 2012; Susilo, 2011).

The cultivation of religious values is considered to be the domain of religion subject teachers through Islamic Religious Education (PAI), while the value, moral, tolerance, and nationalism values are left to the teachers of PPKn (civics subject). Consequently, there is an

alienation of the value of the reality of life, so character education and value cultivation are relatively less successful (Salafudin, 2013). One way to make the goal works is to put the character values on each lesson.

According to Suyitno (2014) mathematics is also related to religious life. Moreover, Islam has five pillars, namely shahada, prayer, fasting, zakat and hajj pilgrimage. All those pillars are not separated from mathematics. In addition, the construction the values of religiosity based on mathematical objects not only gives the meaning of mathematics materials contextually on the learner's life, but also strengthens the students' belief in the truth of divine revelation that is synergistic with the facts of natural law that exist in the field.

One approach to mathematics learning which is in accordance with Indonesian curriculum as well as in line with the objective of PISA is learning by using the approach of Realistic Mathematics Education (Wijaya, 2012). This approach is also used in Islam study. Its implementation on Islamic character is done through the process of characterizing the students by giving materials that lead to *akhlakul karimah* (good attitude) by involving active participation of the students, while the teacher becomes the motivator who triggers the students to be active. For more, at school, RME includes daily worship activities such as sunnah prayer, covering *dhuha* and *rowatib* prayers, *dhuhur* prayer in congregation, dhikr and pray together, reciting al-Quran and hadith before starting the lesson and accustomed to behave like doing positive things, doing good deeds, and behaving politely. Those acts will bring the students to a firm and obedient faith in fulfilling their religious duties.

Based on the results of observation and experience researchers teach that the subjects of mathematics is a subject that is not easy so often leads to despair especially geometry. Motivation, perseverance, resilience to math lessons are required. This makes students unable to use the knowledge they have in solving

problems in everyday life. RME learning with Islamic character is expected to overcome the difficulties of learning cube and block material, and can improve the ability of mathematical literacy and improve the character of students in class VIII MTs (Islamic Junior High School) NU Al Hikmah Semarang.

Based on the above background, the purposes of this study were: did RME learning with the loads of the character of Islam effectively improve the ability of mathematical literacy and how was the ability of students' mathematical literacy on the RME learning with the loads of the character of Islam?

METHODS

This study was a mixed method research with concurrent embedded model. The quantitative research in the mixed method was aimed to know the effectiveness of the RME learning with the loads of the character of Islam, while the qualitative research was aimed to analyze the ability of students' mathematical literacy. Alternatively, this study was conducted at MTs NU Al Hikmah in class VIII in the academic year of 2017/2018, with the materials of cube and beam. Mean while, the subjects of the study in quantitative research was class VIII A as a class which was given treatment using RME learning with the loads of the character of Islam and class VIII B as a class with expository learning. Additionally, pretest was given to both classes to gain initial capability.

The initial abilities of students' mathematical literacy were then tested for normality, homogeneity and equality average tests to know that the classes had the same ability so that it could be continued as the research subjects. Further, in qualitative research, the subjects of research used only the class that received the treatment with RME learning with the loads of the character of Islam (VIII A) in which the selection of the subjects was done using purposive sampling technique,

namely the technique of taking the subject with certain considerations (Sugiyono, 2015: 126). Again, the subjects used as data sources were group of students with RME learning with the loads of the character of Islam (VIIIA) consisting of 2 students in the upper group, 2 students in medium group and 2 students in the lower group. Each selected student was analyzed on his mathematical literacy ability.

The effectiveness of RME learning with the loads of the character of Islam was achieved when the students achieved subject passing grade. Apparently, the class which received RME learning with the loads of the character of Islam was better than the expository class when analyzed using average difference test and improvement test. Meanwhile, the ability of mathematical literacy was analyzed descriptively based on the document of test results and interview to student's representation. At last, the data were validated using triangulation techniques where the source of the interview was not only the student's representation, but also the peer students in the same group and the mathematics subject teacher.

RESULT AND DISCUSSION

Based on the results of the normality test analysis of the students' initial mathematics test, it was known that the two classes were normally distributed. The significance value for the experimental class was $0.865 > 0.05$ and the control class obtained the synergy value of $0.400 > 0.05$. Alternatively, homogeneity test showed that the first mathematics test of the students of experimental class and control class had the same or homogeneous variant with the distribution value of $F \text{ sig} = 0.375 = 37.5\% > 5\%$. Moreover, the average equality test showed that the students' mathematics literacy skill test and control class students had the same variant as the distribution value of $F \text{ sig} = 0.682 = 68.2\% > 5\%$.

Meanwhile, the analysis results of normality test of TKLM of the students in the class which was given RME learning with the loads of the character of Islam and expository class students showed that both classes were in normal distribution. The significance value for the class with RME learning with the loads of the character of Islam was $0.694 > 0.05$ and the expository class obtained the significance value of $0.100 > 0.05$. On the one hand, homogeneity test showed that TKLM of the students in the class with RME learning with the loads of the character of Islam and expository class had the same or homogeneous variant with distribution value $F \text{ sig} = 0.072 = 7.2\% > 5\%$.

The classical thoroughness test of 32 students showed that 29 students were completed and 3 students have not been completed. Even, the percentage mastery reached 91%, so that the percentage of completeness has exceeded 75%. From the calculation of completeness test, it was obtained $Z_{\text{count}} = 2.04$, while $Z_{\text{table}} = 1.64$ = therefore, $Z_{\text{count}} > Z_{\text{table}}$ or $2.04 > 1.64$. Thus, H_0 was rejected or H_1 was accepted. It meant that the proportion of students who received RME learning with the loads of Islamic characters achieved the completeness of TKLM value exceeded 75%

The comparative test was conducted to find out whether there was a difference in the average of students' KLM as well as to compare which one was better between the mean of KLM class students with RME learning with the loads of Islamic characters or students who were exposed to expository learning. Further, this test obtained t value of 5.37 with the degree of freedom (df) = 62. Also, the test with significant level of 5% obtained $t_{\text{table}} = t_{(62, 0.05)} = 1.67$. From this equation, it was known that the value of $t_{\text{count}} > t_{\text{table}}$ or $5.37 > 1.67$. Therefore, H_0 was rejected. It meant that the average of students' KLM in class with RME learning with the loads of Islamic characters was higher than the students' KLM on expository learning.

The ability of students' mathematical literacy with RME learning with the loads of

Islamic characters was better than the student's KLM on expository learning. It was proven by the experimental class average of 84.25 and the expository class average of 76.78. Furthermore, the result of the output on the independent sample test showed that the t significance value was in the sequence of equal variances not assumed, and obtained $t = 0.00 = 0\% < 5\%$ so that there was a significant difference in the ability of students' mathematical literacy with RME learning with the loads of Islamic characters and expository class.

Based on the normalized gain test on the class with RME learning with the loads of Islamic characters, it was found that there was an increase in the classical gain showed by the average of the initial test score of 52.6 increased to 84.2 in the final test. Then, the classical gain reached 0.7 with high category. An increase in the normalized gain of the expository class apparently caused an increase in classical gain. It was proven by the increase of the average initial test score of 53.9 increased to 76.8 in the final test. The increase of classical gain of the expository class exposed to 0.5 in medium category. Therefore, the gain increase was normalized classically on the students in the class with RME learning with the loads of Islamic characters which achieved higher average than the expository class. Accordingly, based on the results of the difference test, the average score of gain obtained $t_{\text{count}} = 5.37$. 5%. Real rate of 5% and $dk = 62$ obtained $t_{\text{table}} = 1.67$. It was because $t_{\text{count}} > t_{\text{table}}$, then H_0 was rejected. Thus, it could be concluded that the gain scores of the students in the class with RME learning with the loads of Islamic characters were higher than the expository class.

The ability of students' mathematical literacy on the RME learning with the loads of Islamic characters was divided into 3 groups of students, namely upper, middle and lower. The upper group was represented by the E-12 and E-24 subjects, the middle group was represented by the subject E-05 and E-30, and the students with

the lower group was represented by the subject E-11 and E-25.

The upper group students could solve the problem perfectly. Based on the results of study, the data showed that students' communication skills in understanding, clarifying and formulating a problem was good. There were only a few drawbacks such as lacking in explaining what was asked on the subject, but it could be said that the students were very capable of identifying the mathematical component in the problem.

This upper group students had high ability in mathematising component. They created a complete and coherent mathematical model. The model was later used by students to solve the problem. Further, the data showed that the students were able to change the problems from the real world to the form of mathematics and interpret the mathematical model into real problems. This ability also belonged to the ability to representation because the students had presented the problem in the form of formulas and drawings. The formula was written in a coherent manner and the image presented was made using a ruler. As a result, it appeared that students were able to simplify the problem and make it easy to accept by making images using mathematical tools.

Again, the upper group students was capable of manipulating numbers, algebraic forms, equations and geometric shapes. It was showed by the representation of the questions that have been made using appropriate mathematical symbols. In facing these questions, the students did not experience significant difficulties in the ability of using symbol. They are able to apply symbols, facts, rules and mathematical structures. The ability to understand the problem and make the right mathematical model helped the students in determining the strategy and the steps in solving the problem.

In the conclusion drawing (reasoning and argument), the students were able to explain correctly and completely. This conclusion was

given based on the results of the calculations that have been done. It was known that the students were able to reflect on mathematical opinions and evaluate the reasonable reasons of the solution. It meant that students' reasoning and argument abilities were very good. From the above mentioned analysis of the students' mathematical literacy skills, and interviews with mathematics teachers and peer subjects in the upper groups, it could be concluded that the students' mathematical literacy skills of the upper groups have been very good. This group was very capable of working on math literacy problems coherently.

The middle group students were able to solve the problems of mathematical literacy although there were still some errors. Based on the results of the study, the data showed that students could reveal what was known and asked in the complete problem. This meant that students' communication skills were excellent. They could identify the mathematical component in the problem. It proved that their mathematizing ability was good. They were also able to make mathematical models of real problems but sometimes made errors in entering data caused by their less thoroughness. From the description, it could be said that the students have been able to change the problem into a mathematical model and vice versa. The ability included also into the ability of representation because the students have presented the problem in the form of formulas and tables. The formula was written in coherence and the table presented was made using a ruler. Therefore, it appeared that the students were able to simplify the problem and make it easy to accept by making images using mathematical tools.

In addition, the middle group student did not experience significant difficulties in the ability of using symbols. They managed to apply symbols, facts, rules and mathematical structures. The ability to understand the problem and make the right mathematical model helped the students in determining the strategy and the steps in solving the problem. From the

description, it could be said that this group of students was able to manipulate numbers, algebraic forms, equations and geometric shapes but was still less able to simplify the problem and make it easily accepted by making images using mathematical tools.

The ability of the middle group students in solving the problem was coherent, although they still have not applied the ability devising strategies on all questions. It was proven by their answers in some questions which appeared correct in the initial step, but miscalculation in the middle of work. The students were able to design and implement strategies to find mathematical solutions. This had an impact on students' reasoning and argument ability. On the one hand, the students of the middle group had an average ability in conveying their opinions. They could draw conclusions and fully explain the reasons for the conclusions. Also, the students were able to reflect on mathematical opinions and evaluate the reasonable reasons of the solution.

Based on the analysis of the results of work and interviews of students, as well as interviews on mathematics teachers and peer subjects in the same group, it could be concluded that the ability of students' mathematical literacy was already good. They could deal with the work on mathematical literacy problems.

The lower group students had difficulty in solving the problem. It could be seen from the incomplete work of the students. Based on the results of research, the researchers obtained information that the students could reveal what was known and asked in the problem although not complete. This meant that students' communication skills were already sufficiently able to identify the mathematical component in the problem.

Students in the lower group had good mathematizing skills. All the problems involved required the creation of a mathematical model, but all students were less able to apply the concept rather than make it a mathematical equation that might help to solve the problem.

On the other hand, they were quite capable in turning problems into mathematical models and vice versa. It also meant that students' representation ability was quite good. The students simply created representations in the form of tables and formulas, although there were some questions answered using formulas or tables only. However, the representations made by these students were quite good. They were capable enough to manipulate numbers, algebraic forms, equations and geometric shapes.

The students made table representations which had information, or with information but no use of the data given in the questions. When viewed from the use of symbols (using symbol), the students have not maximized the use of mathematical symbols in accordance with mathematical rules. They still wrote long sentences without using symbols to shorten and clarify the meaning of the mathematical model that has been made. This was because the students were still less able to apply symbols, facts, rules and mathematical structures. Meanwhile, by referring to the representation of drawings that have been made, the students used improper mathematical tools to create images. As a result the image was made neatly, yet their ability to use mathematical tools was quite well. It was proven that they were capable enough to simplify the problem and make it easy to accept by making images using mathematical tools. This had an impact on the results of their works.

The students of the lower group were quite capable of making mathematical models and able to understand working steps in solving problems. Their works have been coherent but sometimes the solution was not correct. This was because the students were able to determine the strategy to solve the problem. It meant that the ability of devising strategies for solving problems in students was quite good. They were quite capable of designing and implementing strategies to find mathematical solutions. In addition to impacting devising strategies for solving problems, it also had an impact on the

ability of reasoning and argument. The right answer will produce the right conclusion. In line with this, the students were capable enough to reflect mathematical opinions and evaluate the reasonable reasons of the solution.

Based on the analysis of the results of students' works and interviews of students, as well as interviews of teachers of mathematics, it could be concluded that the ability of students' mathematical literacy was quite good. Those in the lower group were sufficiently able to identify the information on the problem and work on mathematical literacy.

CONCLUSION

Based on the results and the discussion, it can be concluded that the class with RME learning with the loads of Islamic characters can effectively improve students' mathematical literacy ability, because (1) the KLM of students with RME learning with the loads of Islamic characters has reached the classical completeness beyond 75%; (2) the KLM of the students in the classroom with RME learning with the loads of Islamic characters are better than the expository class; (3) the increase in KLM of students in class with RME learning with the loads of Islamic characters are higher than the students in expository class. Also, the mathematical literacy ability of the students in the upper group category is very good, the students' mathematical literacy ability of the middle group is in good category, and the students' mathematical literacy ability of the lower group is in quite good category. At last, the students' behavior has reflected the character of Islam, namely to do the habits which have *akhlakul karimah*.

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