Improving Mathematical Literacy of MTs Students through Problem Based Learning

Muhammad Farid Nasrulloh[1*], Zulaikhotun Nurlia[2]
[1,2]Mathematics Education, Universitas KH. A. Wahab Hasbullah
*Email: faridnasrulloh@unwaha.ac.id

ABSTRACT
This study aims to describe students' mathematical literacy skills seen from each indicator on students' mathematical literacy skills at level 1. The method used is a quasi-experimental research design with non-equivalent control group design and qualitative descriptive. The population in this study were all students of class VII MTs in a private school in the city of Jombang with a sample of two classes by purposive sampling. Where one class as an experimental group using a problem based learning (pbl) learning model and another class as a control group using ordinary learning. The instrument of this research is a test of students' mathematical literacy skills at level 1. Based on the results of research and discussion, it can be concluded that increasing students' mathematical literacy skills at level 1 for students who receive problem based learning (pbl) is better than increasing students' mathematical literacy skills at level 1 towards students who received ordinary learning and the percentage in answering questions seen from the aspect of students' mathematical literacy which included the first indicator, the control group was better, while the experimental group was superior in the second, third and fourth indicators.

Keywords: Problem Based Learning;Math Literacy.

INTRODUCTION

Mathematics is one of the sciences that must be mastered by all Indonesian citizens. This is because mathematics is the basic science of science and technology. This is in accordance with the presentation from Khotimah & Nasrulloh (2019) states that mathematics is the basis of all science and technology in this world. Therefore, mathematics is a mandatory thing that must be owned by every individual both in terms of application and mindset. The fact is that without us realizing that we have often applied mathematics along with the passage of everyday life. So that it can be interpreted that mathematics has an important role, especially in science, by learning mathematics we are trained to always think logically and critically in solving problems(Pratiwi & Ramdhani, 2017). So mathematics can also train our tenacity, perseverance and thoroughness.

Mathematical literacy can be defined as an ability to formulate, use and interpret a problem-solving process in various contexts and is able to reason mathematically and use concepts, facts and procedures to describe and explain a phenomenon or event. Mathematical literacy helps someone to understand the role or use of mathematics in everyday life while using it to make the right decisions as citizens who build, care and think (Pratiwi & Ramdhani, 2017). Mathematical literacy is also able to improve our critical thinking so that we are able to use mathematics appropriately. Indonesia's participation in the International Trends in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA) studies since 1999 also shows that the achievements of Indonesian children are not encouraging in several reports issued by TIMSS and PISA (Khotimah & Nasrulloh, 2018).

This can be seen from the results of the latest PISA research released by the OECD (Organization for Economic Co-operation and Development) which states that the ability of Indonesian students to read achieves an average score of 371 points, which is still low compared to the average score of OECD countries, namely of 478 points. Then the average score for mathematical literacy scores reached 379

points, still low when compared to the OECD country's average score of 478 points. Furthermore, for scientific literacy, the average score of Indonesian students reached 389 points, still relatively low when compared to the OECD average score of 489 points. Mathematical literacy skills can be developed starting from the lowest school level and starting to be honed at the MTs/SMP level. PISA develops six categories of students' mathematical abilities that reflect the cognitive abilities of students(Khotimah & Nasrulloh, 2018). The level of mathematical ability according to PISA is presented in the following table.

Table 1. Mathematical Literacy Ability Level

Level	Indicator
1	Using knowledge to solve problems in general context
2	Interpret problems and solve problems using formulas
3	Carry out procedures in solving problems and can choose the right strategy in problem solving
4	Work effectively with models and be able to select and integrate different representations.
5	Work with models for complex situations and be able to solve complex problems.
6	Able to apply reasoning skills in solving mathematical problems and make generalizations, formulate and communicate the results of their findings.

Students at the MTs level will be measured the level of mathematical literacy ability in accordance with the order of levels. In this study, students' mathematical literacy skills will be measured based on the indicators found at level 1. The following are indicators of students' mathematical literacy skills at level 1.

Table 2. Indicator of Mathematical Literacy Ability Level 1

Indicator of Mathematical Literacy Ability
• Formulating real problems in problem solving
• Mathematization (using mathematics in problem solving)
• Interpret solutions in problem solving
• Evaluating solutions in problem solving

The learning style or learning model used by the teacher will also affect the level of students' mathematical literacy skills. The learning model used is different, so the achievement of students' mathematical literacy skills will also be different. This is in line with the opinion from Khotimah & Nasrulloh (2019)that which states that the different learning style models of students have different mathematical literacy abilities. There are various learning style models that use a review of how students understand information, one of which is the learning style model developed by Felder & Silverman. Felder R.M. & Silverman L.K (1988) defines learning style as an individual's way of receiving, processing, and using the information obtained.

Based on the results of an interview with one of the mathematics teachers, it was found that when viewed from the indicators on mathematical literacy, there were still many students who did not fulfill it. This is because students prefer to directly answer with a value compared to including a problem-solving process or concept. This can be seen from the results of student work at the beginning of the test. In addition, the teacher also explained that students were also less active in the learning process so it was difficult for him to improve students' mathematical literacy indicators. This is in line with research conducted by Intan Purnama (2020)about Students' Mathematical Literacy Ability in Problem Based Learning (PBL) in SMP, where he stated that mathematical literacy in students will be difficult to develop if a teacher has not been able to find an effective learning process used, and students have not been able to apply concepts and procedures appropriately in the process. solution to problem.Based on the description and problems above, the researcher wants to know the increase in the mathematical literacy ability of MTs students through the problem based learning (PBL) learning model. The purpose of this study is to describe students' mathematical literacy skills seen from each indicator on students' mathematical literacy skills at level 1.

METHOD

The research method used is a quasi-experimental research. Where sampling is done by using a purposive sampling technique, namely the choice of two classes as the control group and the experimental group. From the two classes used as samples by getting two different treatments, the results obtained are class VIIA as a control group consisting of 23 students using the ordinary learning model and class VIIB as an experimental group consisting of 23 students using a problem based learning model. learning (PBL). This study emphasizes on increasing students' mathematical literacy both in the control group and in the experimental group. Both classes were given a pretest and posttest as a comparison of the learning success. This research was conducted in one of the private schools, namely MTs Al-Asy'ariyah Banjarsari. The design used in this research is *nonequivalent control group design*.

Prior to treatment or action, both groups will be given a pretest which aims to determine students' mathematical literacy abilities. After carrying out the pretest, the experimental group was given learning using a problem based learning (PBL) learning model, while the control group used a learning model commonly used by teachers. After the material was finished, both groups were given a posttest which aims to determine the increase in students' mathematical literacy skills after learning. The student's mathematical literacy ability test consists of 5 items that have been validated by 2 validators, where the scoring of each item that has been answered is adjusted to the guidelines for scoring students' mathematical literacy skills at level 1. This study also describes the mathematical literacy ability of level 1 students, so it includes qualitative descriptive research. Data analysis carried out in this study is by investigating the test results. The data analysis carried out is as follows:

$$P = \frac{f}{N}\%$$

Which:
P : Percentage figures
f : The frequency you are looking for is the percentage
N : The number of frequencies or the number of individuals

RESULT AND DISCUSSION
Result

Quantitative data on the level 1 students' mathematical literacy skills were obtained from the pretest, posttest and gain index. The gain index data analysis in this study was used to determine the increase in students' mathematical literacy skills, both the experimental group using the problem based learning (PBL) learning model and the control group using the learning model commonly used by teachers. The inference test carried out on the data on increasing students' mathematical literacy skills includes the normality test, homogeneity test, and the average difference test. The following is a description of the inference test for data on increasing students' mathematical literacy skills.Based on the results of the normality test and homogeneity test, it is known that the data obtained are normally distributed and homogeneous data so that the next test can be carried out, namely the average difference test. The test for the difference between the two averages on the results of the gain index is carried out by using a one-party test with statistical hypotheses as follows:

$$H_o : \mu_1 = \mu_2$$
$$H_1 : \mu_1 > \mu_2$$

description :
μ_1 : Improved mathematical literacy skills of students who received problem based learning (PBL).

μ_2 : Improved mathematical literacy skills of students who received ordinary learning.

The test criteria using a significance level of 5% are as follows:
- If the value of sig/2≥0.05 then Ho is accepted
- If the value of sig/2≤0.05 then Ho is rejected

The results of the T test are as follows:

Table 3. Average Difference Test Results

Average Difference Test		
Levene Statistics	df	Sig.(2-tiled)
3.855	44	0.056

The table above, it can be seen that the value of sig/2 is 0.028, which means that the significance value is less than 0.05, then Ho is rejected and H1 is accepted, which means that the increase in mathematical literacy skills of students who get problem based learning (PBL) is better. compared with the increase in mathematical literacy skills of students who received ordinary learning significantly. Based on the results of data processing and data analysis, it can be concluded that through the posttest results, it can be seen that there is an increase in students' mathematical literacy skills. This increase did not only occur in the experimental group, but also in the control group. However, the increase in students' mathematical literacy skills from the two groups was not too high, but based on data analysis on the posttest results, it can be seen that the increase in students' mathematical literacy skills in the experimental group was much higher or better than the control group.The following is a description of the comparison of the mathematical literacy abilities of early and late students in the experimental group and the control group.
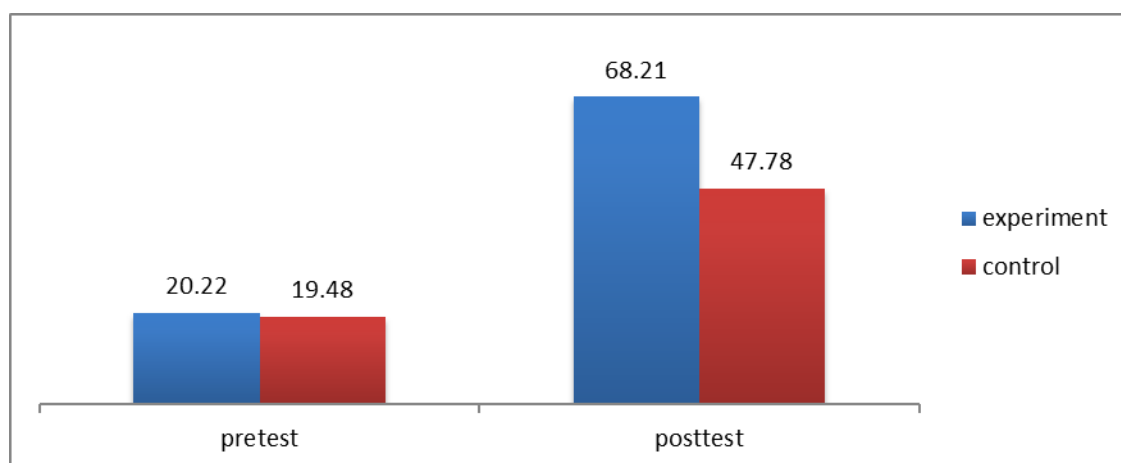

Figure 1. Difference in Student Average Score

The picture above shows that there are differences in the mathematical literacy abilities of early and late students between the experimental group and the control group. It can be seen in the picture that before being given treatment, the mathematical literacy ability of students in the two groups was almost the same and after being given different treatment to the two groups, it turned out that the mathematical literacy ability of students in both groups could increase. The experimental group increased by 55% from the average value of 20.22 to 68.21 while the control group increased by 45% from the average value of 19.48 to 47.78. Based on the description of the difference in the average value between the experimental group and the control group, it can be concluded that the achievement of students' mathematical literacy skills in the experimental group is better than the control group.

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Discussion

Based on the analysis of the data from the research results, it can be obtained that the students' initial mathematical literacy skills at level 1 are shown by the students' answers to the 5 questions that have been done. The level of difficulty and the proportion of correct answers on each item shows the level of student achievement in each item. Based on the results of data processing, it appears that quite a lot of students gave direct answers without being accompanied by working procedures and explanations in working on these questions. This shows that students have not been able to provide explanations in the form of formulating, using mathematics, interpreting and evaluating the results of their work in accordance with the procedure for working on each item tested in the pretest. Based on level 1 competence, mathematical literacy questions consist of 4 indicators, the percentage of students in answering questions about aspects of student mathematical literacy is presented in the following table:
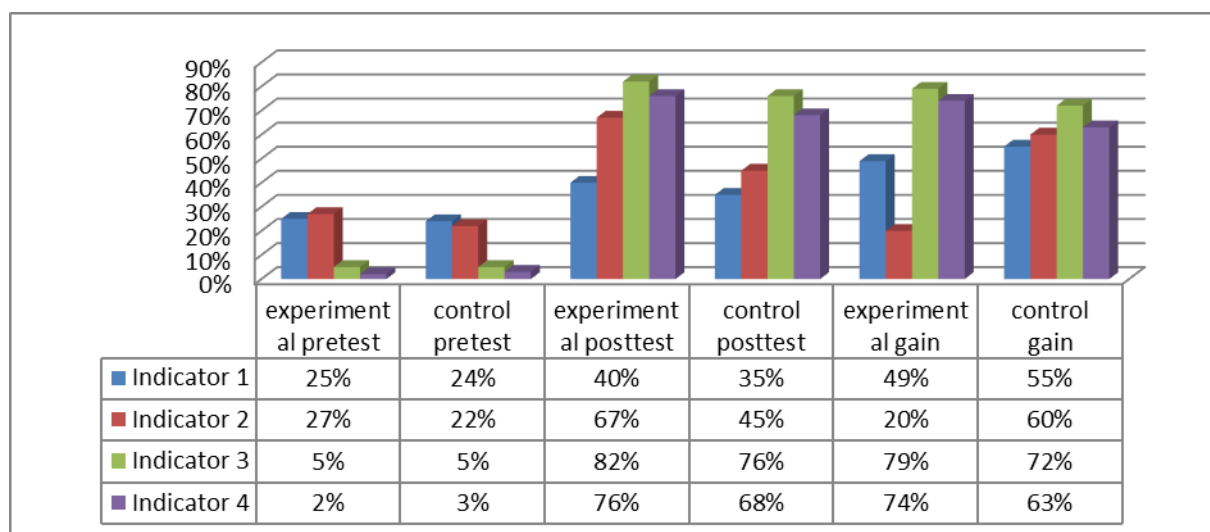
	experiment al pretest	control pretest	experiment al posttest	control posttest	experiment al gain	control gain
■ Indicator 1	25%	24%	40%	35%	49%	55%
■ Indicator 2	27%	22%	67%	45%	20%	60%
■ Indicator 3	5%	5%	82%	76%	79%	72%
■ Indicator 4	2%	3%	76%	68%	74%	63%

Figure 2. Improvement of Level 1 Students' Mathematical Literacy Indicators

The percentage of greeting students who answered the questions based on the aspect of students' mathematical literacy which included the first indicator the control group was better, while the experimental group was superior in the second, second and fourth indicators. This is because the use of the probem based learning (pbl) learning model has an influence on the achievement of students' level 1 mathematical literacy skills, especially on the second indicator because of several aspects that exist in level 1 mathematical literacy trained during learning using the problem based learning model. (pbl) this is done. Students' mathematical literacy abilities are able to develop optimally because of the provision of problems that can familiarize students to apply strategies or problem-solving concepts appropriately so that students can solve the problems given, the presentation of questions is adjusted to the facts that exist in everyday life so that students can imagine what and what to do. how to solve the given problem, and the problem based learning (pbl) model starts from student orientation to the problem then begins to solve the problem by detecting, searching, and finding the root cause of the problem, then designing and implementing a solution and then reflecting on the investigation that has been done. done. This is in accordance with the process indicators in mathematical literacy, namely formulating problem solving mathematically, using mathematics to solve problems, interpreting problem solving and evaluating problem solving solutions.

Even though the experimental group was low on the first indicator, the experimental group was able to improve the achievement of the first, second, third and fourth indicators. This is because the application of the problem based learning (pbl) learning model requires students to pay more attention to the results of problem solving in accordance with the right concepts and procedures so that students in the experimental group have better average results than those in the experimental group. So, it can be concluded that the improvement of level 1 students' mathematical literacy skills in students who receive problem based learning (pbl) is better than the improvement of level 1 students' mathematical literacy skills in students who receive ordinary learning.

CONCLUSION

Based on data analysis, researchers can draw the following conclusions:
- Increasing students' mathematical literacy skills at level 1 for students who receive problem based learning (pbl) is better than increasing students' mathematical literacy skills at level 1 for students who receive ordinary learning.
- The percentage in answering questions is seen from the aspect of students' mathematical literacy which includes the first indicator, the control group is better, while the experimental group is better at the second, third and fourth indicators.

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