



The Ability of Student' Math Literation on Learning Model Problem-Based Learning (PBL)

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Abstract

Indonesian students' mathematical literacy based on PISA and PIRLS assessments is still in the low category. Mathematical literacy covers how students are able to know and use basic mathematics to solve problems in real life contexts. Problem Based Learning Model is a learning model that can solve problems in real life contexts by facilitating the development of junior high school students' mathematical literacy. The main principle of Problem Based Learning emphasizes mathematical problems that are human activities and must be meaningful for students, become a motivator to improve mathematical literacy skills through the stages of learning. This article examines the mathematical literacy ability of SMP Negeri 11 Bengkulu students before and after going through the Problem Based Learning Model. students' mathematical literacy skills prior to the application of the Problem Based Learning model have a percentage of 25% for the medium category and 75% are in the low category. Then for students' mathematical literacy ability after applying the Problem Based Learning model has a percentage of 5,5% for the medium category, 89% is in the low category, and 5,5% is in the high category. The results of inferential statistical analysis (Paired Sample T-test) obtained a significance value <0.05 . This means that there is an increase in students' mathematical literacy skills after the application of the Problem Based Learning model in class VII SMP Negeri 11 Bengkulu City.

Keywords: *Literacy Ability; Problem Based Learning*

Preliminary

Mathematics equips students to have the ability to think logically, analytically, systematically, critically and the ability to work together, so it needs to be given to all students for every level of education from elementary to college. The purpose of learning mathematics formulated by the National Council of Teachers of Mathematics/NCTM (2000:7) is that students must have the ability: (1) mathematical communication, (2) mathematical reasoning, (3) problem solving, (4) mathematical connection, and (5) mathematical representation. The purpose of learning mathematics is in accordance with the aspects of developing mathematical literacy.

Mathematical literacy is a person's ability to formulate, apply and calculate mathematics in various contexts, including the ability to reason mathematically, use concepts, procedures, facts, and mathematical aids to describe a phenomenon or event (OECD, 2019a). This mathematical literacy ability is in accordance with the mathematical abilities assessed in the Program for International Student

Assessment (PISA). Mathematical abilities used in the PISA assessment (OECD, 2019), namely: (1) communication (communication), (2) mathematizing (mathematizing), (3) representation (representation), (4) reasoning and arguments (reasoning and argument) , (5) formulating strategies to solve problems (devising strategic for solving problems), (6) using symbolic, formal and technical language, and operations (using symbolic, formal and technical language and operations), (7) using mathematical tools (using mathematical tools). Students' mathematical literacy skills are very important in the mathematics learning process. The lack of mathematical literacy skills makes students' ability to reason, argue and be creative does not develop so it is difficult to solve mathematical problems in everyday life.

The 2018 Program for International Student Assessment (PISA) results show that Indonesian students have literacy skills with a low average score. PISA is carried out by the Organization for Economic Cooperation and Development (OECD) which tests students' literacy skills after attending basic education (15 years). Indonesian students rank 72 out of 77 countries with an average score of 379. The mathematical literacy ability of Indonesian students only reaches 28% at level 2 (OECD, 2019). The literacy that is assessed by PISA includes language/reading literacy, mathematical literacy, scientific literacy and financial literacy. This PISA assessment framework shows literacy not only in language subjects, but also scientific literacy, mathematical literacy, including financial literacy. However, literacy is often viewed narrowly only in language subjects.

Based on observations at SMP 11 Bengkulu City, literacy formation is directed at the habituation stage and is still focused on language literacy. The formation of literacy in other domains has not been touched, including mathematical literacy. Another fact is shown by the inability of students to solve problems in the form of formulating, applying, and even interpreting mathematics into various contexts. Literacy is closely related to the demands of reading skills. Literacy includes how a person is able to understand information analytically, critically and reflectively including encouraging the ability to identify, determine, find, evaluate and create effectively and in an organized manner including the ability to communicate (Sari, 2015). Literacy can be defined as the ability of students to read not only textbooks, but various phenomena in everyday life as an analytical, critical and reflective learning environment. Thus, literacy is very important for students to bridge learning activities at school with their application in everyday life. (Carter, 2010:40) argues that mathematics is not just counting, but also a conversation. He believes that children can think deeply about mathematics if it is supported by a learning environment that provides a comfortable environment to ask questions and try out mathematical ideas when trying to understand a mathematical concept, including through conversation. The implication of Carter's opinion on learning mathematics in schools is how teachers need to create a learning environment including math conversation topics that are in accordance with mathematical concepts as well as the level of students' cognitive development. According to Piaget, junior high school students are at the stage of concrete operational cognitive development (Schunk, 2012: 237-238), so that in the learning process mathematics still relies on concrete objects which in their development are directed towards something semi-abstract and abstract. Therefore, learning mathematics in junior high schools must examine or connect real contexts in everyday life in the mathematics problems being studied. This will help students see that mathematics is present in the student's world, including appreciating the usefulness of mathematics in life.

But in fact, mathematics is still considered a difficult subject and is a set of formulas that are independent of the context of students' real lives. This is indicated by the fact that most students master mathematics by memorizing without understanding, so that when given questions with different contexts, students have difficulty solving them. This is in line with (Asmara & Sari, 2021) which states that most students are less accustomed to solving problems that are not the same as the procedures studied. If students are given questions with a different pattern from the examples taught, students will find it difficult. The essence of mathematical literacy is that students are able to use the knowledge and basic competencies in mathematics that are learned to be used confidently in solving problems in the context of everyday life (Ojose, 011:91). Thus it is appropriate if mathematical literacy is developed since elementary education. Therefore, it is necessary to study theoretically how mathematical literacy can be facilitated or

developed through learning in junior high schools. Mathematics learning in junior high school is divided into three major groups, namely concept planting, concept understanding and skill development (Heruman, 2013: 2). This stage is intended to achieve the ultimate goal of learning mathematics in junior high school, namely so that students are skilled in using various mathematical concepts in everyday life. However, in its development, learning often becomes an activity of memorizing formulas and does not vary using the real context around students. This results in students not understanding mathematical concepts thoroughly, and when given math problems in different contexts students often have difficulty. This situation creates a perception in students about mathematics that is difficult and cannot be used in the context of daily life, which then becomes the trigger for the development of students' mathematical literacy skills. Therefore, it is necessary to develop learning that makes problems in real contexts to improve the quality of mathematics learning in junior high schools. One of the learning models that uses problems in a real context is the Problem based Learning model. PBL model is a learning model that applies contextual problems so as to stimulate students to learn to solve real-world problems (Kemendikbud, 2013). PBL model learning has six steps presented in the table. 1.

Table 1. PBL Model Steps

Phase	Teacher's Role
Student orientation to problems	The teacher explains the learning objectives, explains everything that will be needed, motivates students to be seen in the problem solving activities they choose
Organizing students to learn	The teacher helps students define and organize learning tasks related to the problem
Guiding individual and group investigations	The teacher encourages students to collect appropriate information, carry out experiments or observations to get explanations and problem solving
Develop and present the work	The teacher helps students in planning and preparing appropriate works, carrying out experiments or observations to get explanations and problem solving
Analyze and evaluate the problem solving process	Teachers help students to reflect or evaluate their investigations and the processes they use

(Pertiwi & Widyaswara, 2017)

Method

The approach used by researchers is a quantitative approach. Where quantitative research is a type of research that produces findings that can be achieved (obtained) using statistical procedures or other means of qualification (measurement). This research is a Quasi Experimental research, this design form is a development of True Experimental Design, which is difficult to implement.

The quasi-experimental design aims to obtain information that is an approximation to the information that can be obtained by actual experimentation under conditions where it is not possible to control and/or manipulate all relevant variables. The research design used is One Group Pretest-Posttest Design. In this design, one group of subjects is used. First, a measurement (pretest) is carried out, then treatment is applied in this case the application of the Problem Based Learning model for a certain period of time, then the measurement is carried out a second time (posttest). The population referred to in this study were all seventh grade students of SMP Negeri 11 Bengkulu City for the 2020/2021 academic year

with a total of 241 people consisting of 7 classes. The sample that became the subject of the research was Class VII B students with 36 students selected as the research class. The instrument used in this study was a test of mathematical literacy ability. The test will be given in the form of an essay question. There are two kinds of statistics used for data analysis in research, namely descriptive statistics and inferential statistics. The prerequisite test in this study is the normality test and then the hypothesis testing.

Results and Discussion

Based on the results of research that has been carried out in SMP Negeri 11 Bengkulu City. The mathematical literacy test scores given to students before and after the application of the Problem Based Learning learning model in class VII B SMP Negeri 11 Bengkulu City have been processed with SPSS version 20.

A pretest was conducted with the lowest score obtained in class VII B was 30.00 and the highest score was 40.00. The average value obtained is 43.70 with a standard deviation of 6.669. This means that the distribution of the data is mostly in the set within plus minus 6.669 from the average. After applying the Problem Based Learning model, a final test (posttest) was carried out with the lowest score obtained was 40.00 and the highest score was 65.00. The average value obtained is 51.35 with a standard deviation of 5.825. This means that most of the data distribution is in the set, plus or minus 5.825 from the average.

Based on the results of the pretest and posttest in class VII B, the average value of mathematical literacy skills increased, namely the average value of the pretest was 43.70 while the average value of the posttest was 51.35.:

a). In the pretest there were no students in the very low category, 27 students (75%) were in the low category meaning (75%) students were only able to use mathematical formulas, 9 students (25%) were in the medium category meaning that only 25% of students were able to use formulas, and carry out simple procedures, and 0% of students' pretest results are in the high and very high categories or it can be said that there are no students who have been able to meet all indicators of mathematical literacy ability.

b). In the Posttest there are 0% of students are in the very low category, 2 students (5.5%) are in the low category meaning 5.5% of students are only able to use mathematical formulas, 32 students (89%) are in the medium category meaning that almost all students have been able to use formulas, and carry out simple procedures, 2 students (5.5%) were in the high category meaning that there were only 5.5% of students who were able to use relevant information from the questions, use formulas and were able to carry out simple procedures to answer questions. There are no students (0%) who are in the very high category, meaning that there are no students who are able to meet all indicators of mathematical literacy ability.

The testing technique used is the Paired Sample T-test with a significant level = 0.05. Based on the calculation results of the Statistical Package for Social Science (SPSS) obtained a significant value = 0.000 so it can be concluded that H_0 is rejected and H_1 is accepted because the value of $\text{sig} < (0.000 < 0.05)$. So, there is a significant difference between the mathematical literacy abilities of class VII B students of SMP Negeri 11 Bengkulu City before and after the application of the Problem Based Learning model. The research conducted at SMP Negeri 11 Bengkulu City aims to determine the level of students' mathematical literacy skills by applying Problem Based Learning model in class VII mathematics learning in the 2020/2021 Academic Year. The sample in this study was class VII B with a total of 36 students.

From this study, it was found that there was a significant increase in students' mathematical literacy skills after the application of the Problem Based Learning model.

Conclusion

Based on the research results obtained, it can be concluded that the level of mathematical literacy ability of students of class VII Negeri 11 Bengkulu City after the application of the Problem Based Learning model is in the medium category. This shows that the application of the Problem Based Learning model can improve mathematical literacy skills in the material of triangles and quadrilaterals for class VII students in Negeri 11 Bengkulu City. The increase in mathematical literacy skills can be seen in the average score of students before the application of the Problem Based Learning (pretest) model, which is 43.70, while after the application of the Problem Based Learning model, the students' average score (posttest) has increased, which is 51.35.

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