

Mathematical Literacy: How if Reviewed from Mathematics Problem Solving Ability of High-Grade's Elementary School Students?

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Abstract

This study aimed to find out the mathematics literacy of high school students in terms of the ability to solve mathematical problems. This research used qualitative approach with phenomenology descriptive type. The population of this study were 360 students sd high grade, while the sample of this study amounted to 180 students consisting of IV, V, and VI grades. The method used in this research is interview, observation, and documentation in the form of description test. Test description was tested as much as 4 items which is a matter of solving math problems. The test results analyzed and supported by observations during the lesson, as well as interviews to high- grade teachers. The results showed that high school students, especially grade IV, were still at the second level of mathematical literacy defined by PISA. While V and VI grades are still at the third level of mathematical literacy by PISA. Based on these results, it is necessary to find a strategy in the process of learning mathematical literacy, which allows for the ability to solve math problems students sd high-grade increasing.

Keywords: *mathematical literacy, mathematics problem solving ability*

INTRODUCTION

The mathematics literacy of Indonesian students is ranked 50th out of 49 countries and 6 continents with a score of 397 from a score of 500 so that Indonesia is included in the low category. This causes mathematical literacy to be reviewed why Indonesian students' mathematical literacy is in the low category.

Mathematical literacy in learning mathematics is a standard that must be mastered by learners in order to develop and improve the competence of math skills of learners. The individual's ability to communicate and explain the phenomena encountered with mathematical concepts takes precedence over mathematical literacy.

Mathematical literacy is an individual's ability to formulate, use, and interpret mathematics in a variety of contexts that include the use of concepts, procedures, facts in mathematics that can develop the ability and confidence to think numerically and spatially in interpreting and analyzing and solving problems of a daily phenomenon. day activities to be more prepared for life's challenges (OECD 2016; DoE 2003; Ojose 2011; Stecey and Tuner 2015).

Literacy generally has four aspects: reading, writing, speaking, and listening or listening (Woolley 2014). But in this study focused on reading and writing, especially on mathematics.

The first aspect is reading. Reading is an active process for understanding the meaning of language in the form of systematically arranged letters that are the fulcrum in education (Woolley 2014; Simmons & Kameenui 1998). Reading activities can help learners to understand the meaning contained in a reading. Reading can increase the learner's chance to learn to think critically to become a lifelong independent learner. Reading mathematics is a series of individual activities in stringing words or sentences to understand a description in math problems and interpret what has been read.

The second aspect of writing. Writing is a combination of some early reading skills involving a number of cognitive and physical processes that function simultaneously (Barone & Mallette 2013; Woolley 2014). A writing becomes a form of communication of learners to convey ideas, ideas, concepts, and thoughts to others so that others can also know and feel what is in mind (Astuti & Mustadi 2014). Writing a mathematical symbol is an individual activity in composing an idea, idea, or mind through the language media in the form of writing in the form of mathematical symbols to be understood by the reader. Writing mathematics must begin with an understanding of systematic, logical and hierarchical concepts of mathematics from the simplest to the complex (Rumasoreng & Sugiman 2014).

Mathematical literacy as an independent literacy has three aspects of interpreting problems, formulating problems, and using mathematics in solving problems. Mathematical literacy has 5 standard processes: Problem Solving, Reasoning and Proof, Communication, Connections, and Representation (NCTM, 2000).

Mathematical literacy deals with the ability to apply mathematics in everyday problems. Therefore, the process of solving mathematical problems in everyday life becomes an important component in mathematical literacy. The ability to solve problems is the ability of individuals on high-level cognitive aspects that require more fundamental skills to plan and conduct a series of activities in answering open questions in order to achieve the goals set when faced with new situations (Singh 2009; Peer Review 2016; Savage 2012). These more basic skills will help the students in solving the problem step by step. Students who are able to go through high-level cognitive processes, it is hoped that the students will be easier in understanding mathematics and solving existing mathematical problems, and can help improve the skills of planning and organizational skills, and foster self-discipline students (Shirali 2014; NCTM 1989; Siegle 2017).

Problem-solving skills are an integral part and the ultimate goal in learning math is indispensable in the future so that today's education must be able to educate students to become individuals who are able to solve future problems (NCTM, 2000; Musser, Burger, & Peterson 2011; Muhsetyo 2007, Harnett 2008). Students who have problem-solving abilities are expected to face the world's ever-increasing competition as the times change (Harnett 2008). So that in the years ahead, even in the future, students are able to apply the problem-solving skills they have in daily life.

Problem solving does not rely solely on knowledge, concepts or procedures, but also requires information to assist students in choosing the right answers by guessing which ones might be the correct answer, and certainly using a specific strategy (Mutant 2016; Jitendra, Sczesniak & & Buchman 2005) In troubleshooting not looking for the correct solution but the optimal solution. Students are not only required to get the right end result, but are also required to use the means to obtain the final result. The final result is required, but the process of work is more important, because with the process of workmanship, students can know how the pattern of thinking in learning.

A good problem is a problem that when someone does not know immediately may be how to solve it (Lockhart, 2009). Therefore, in solving mathematical problems there are several strategies that can be used (Emre-Akdoğan, Argün 2016; Musser, Burger, & Peterson 2011), i.e.: 1) working backwards, 2) finding pattern, 3) adopting a different point of view, 4) solving a simpler analogous problem, 5) extreme cases, 6) make drawing, 7) intelligent guessing and testing, 8) accounting all possibilities, 9) organizing data, 10) logical reasoning, 11) Use a Variable, 12) Make a List, 13) Draw a Diagram, 14) Use Direct Reasoning, 15) Use Indirect Reasoning, 16) Use Properties of Numbers, 17) Solve an Equivalent Problem, 18) Solve an Equation, 19) Do a Simulation, 20) Use a Model, 21) Use Dimensional Analysis, 22) Identify Subgoals, 23) Use Coordinates, and 24) Use Symmetry.

Problem-solving skills have four indicators that can be used to measure or assess students' ability (Polya 2014; Gok 2014; Montegue 2009; NCTM 2000). The first indicator is Understanding the Problem. This step involves accessing prior knowledge and planning, understanding what problems are being encountered, identifying the elements known, being asked, and the adequacy of the necessary elements. Sometimes in understanding a problem, it takes repetitive reading activity, then paraphrase the elements of the problem by using words or language itself to make it easier to understand. Questions that may arise in this step are "What is not known?", "What data is given?", And so forth.

The second indicator is Devising a Plan. This step involves the preparation of plans and strategies to be used, formulating math problems or devising a mathematical model. In this step the student can visualize a problem by drawing a representational schematic and hypothesizing or making a settlement plan. The question that may arise in this step is "Has there ever been such a thing been resolved?", "Can the previous method be used in the current problem?", And so on. In this indicator can also appear the question, "Which strategy is suitable to solve the problem on the problem?", And so forth.

The third indicator, Carrying Out the Plan, involves the execution of previously prepared plans and strategies for solving problems (new problems and problems) within or outside mathematics. In this step students can predict or predict answers by computing or math calculations. Questions that may appear in this step are "Are each step correct?", "How to prove that the selected step is correct?", And so on.

And the last indicator of Looking Back, this step involves monitoring, adjusting, and adjusting businesses and strategies as needed, including checking the process and explaining the results according to the original problem and using mathematics meaningfully. In this step the student checks that the plan and the answer are correct. Questions that may appear in this step are "Can the answer be searched in other ways?", And so forth.

From these explanations, it can be seen that the intended mathematical literacy includes problem-solving thinking, logical reasoning, communicating and explaining, as illustrated in table 1 below.

Table 1. Mathematical Literacy Literacy Level by PISA 2015

Level	What students can do
6	Students can conceptualize, generalize and utilize information based on the investigation and modeling of complex problem situations, and can use their knowledge in a relatively nonstandard context (above average).
5	Students can develop and work with models for complex situations, identify constraints and define assumptions.
4	Students can work effectively in concrete but complex situations that may involve obstacles in making assumptions.
3	Students can perform procedures clearly, including procedures that require consecutive decisions.

2	Students can interpret and recognize situations in contexts that require direct conclusions.
1	Students can answer questions that involve a known context in which all relevant information and questions are clearly defined.

METHODOLOGY

The approach used in this study is a qualitative approach with the type of research is case study research. This research was conducted at SDN Perumnas Condongcatur and SDN Kentungan, Depok District of Sleman Regency, Yogyakarta. The timing of the research was in May 2017 as a preliminary study. The subjects of the study were principals, teachers and high school students at SDN Perumnas Condongcatur and SDN Kentungan, which consisted of 360 students from 12 high classes. However, because the sampling using purposive sampling technique, then taken representative of 1 class of each high class so that the subject of research to 180 students.

Data collection techniques in this study using interviews, observations, and document analysis in the form of test results. The interview was conducted as a preliminary study in finding the problems in SDN Perumnas Condongcatur and SDN Kentungan. Interviews conducted openly or semiterstruktur so that the subjects interviewed the principal and teachers sd high class at SDN Perumnas Condongcatur and SDN Kentungan. Key points in the interview were then recorded and analyzed. The grid of the interview guide will be explained in table 2 below.

Table 2. Interview guide

Aspects observed	The thing asked
Student problem solving skills at the understanding stage of the problem.	The ability of students to understand the problem by writing the data that is known and the data asked and complete it with symbols for easy to understand The ability of students to explain the problem in accordance with its own sentence.
Student problem solving skills at the stage of making a settlement plan.	Students' ability to explain the core of the problem. Ability of students in making mathematical model of a problem. The ability of students in planning what steps will be used in solving a problem.
Student problem solving skills at the stage of implementing the plan.	The ability of students in solving the problem according to the steps that have been planned. The ability of students in showing the process of solving a problem.
Student solving abilities at the stage of looking back.	The students' accuracy in every work done by checking back the answers that have been made.

Observations were made during the mathematics learning process to see students' mathematical literacy. Observations are focused, because the observations are narrowed down on certain aspects. Subjects of observation in this study ie high school students sd. The grid of observation guidance is as follows.

Table 3. Observation guidelines

Aspects observed	The thing asked
Student problem solving skills at the understanding stage of the problem.	The ability of students to understand the problem by writing the data that is known and the data asked and complete it with symbols for easy to understand The ability of students to explain the problem in accordance with its own sentence.

Student problem solving skills at the stage of making a settlement plan.	Students' ability to explain the core of the problem. Ability of students in making mathematical model of a problem. The ability of students in planning what steps will be used in solving a problem.
Student problem solving skills at the stage of implementing the plan.	The ability of students in solving the problem according to the steps that have been planned. The ability of students in showing the process of solving a problem.
Student solving abilities at the stage of looking back.	The students' accuracy in every work done by checking back the answers that have been made.

Document in this research that is result of student math test. The steps in analyzing the document are: (1) determining the indicators of the problem solving ability of mathematics, (2) making the problem description as much as 4 items about the problem solving daily, (3) carry out writing test, and last (5) students. Indicator of mathematics literacy competency achievement in terms of students' math problem solving ability can be seen in table 4 below.

Table 4. Indicators of mathematical literacy

Mathematical Literacy	Mathematics Solve Problem Ability
Interpret mathematics to solve problems	Identify to known, requested, and required elements
Formulate problems mathematically	Formulate Mathematical problems / develop Mathematical models
Using concepts, facts, procedures, and reasoning in mathematics	Implement a strategy for solving various problems (both similar and new issues) within or outside Mathematics Implement a strategy for solving various problems (both similar and new issues) within or outside Mathematics

Data analysis techniques in this study were conducted during and after data collection, so that the data obtained is arranged systematically and more easily interpreted in accordance with the formulation of the problem. Steps of analysis and interpretation of data is done with the following stages.

The analysis used in this research is the analysis of the achievement of the indicators of students' mathematical problem solving skills as evidenced by the test. In addition to the test there are also observation sheets and interviews conducted by researchers to determine the achievement of indicators of students' math problem solving skills. The last stage is to determine the level of ability of mathematical literacy achieved by each subject and the conclusion.

RESULT

The data obtained from this research consists of two types, namely quantitative data and qualitative data. Data analysis techniques used are qualitative data analysis techniques with quantitative data and qualitative data. Quantitative data analysis is done by checking the test answers continued by looking at the problem-solving process done by the students in solving the problem. In the examination of the answers, the assignment of values did not become the main focus of this study, but more priority examination of answers to students' answers using the troubleshooting steps.

The results of qualitative data analysis obtained through observation and combined with the results of interviews, to trace the students' mathematical literacy in terms of students' math problem solving skills. The results of interviews with some classroom teachers will be described in table 5 below.

Table 5. Interview results

Questions	Teachers Answers
Can students find known elements of a problem?	Students in grade IV, V and IV have been very capable in identifying information or elements of a problem.
Can the student explain or interpret the problems found using his own words and sentences?	Grade IV, V and IV students are used to explaining a problem using their own words and sentences. But the difference is that in grade IV, only able to find the element of a problem from a presentation or a single problem. While grade V and VI have been able to interpret different sources of information and their reasons directly.
Can students simplify or explain the essence of a problem?	As I explained earlier, fourth grade students are only able to explain a single problem, while grades V and VI are already above grade IV.
Can students make a mathematical model of a problem?	Grade IV students have been able to make a single mathematical model of a problem, while grades V and VI have been able to create a mathematical model of the example of a different problem.
Can the students plan what steps will be used in solving a problem?	Students in grade IV, V and VI have been able to make a plan or estimate which formula to use in a problem.
Can the students solve the problem according to the planned steps?	Grade IV, V and VI students are able to solve the problem according to planned steps, but if given a problem with a somewhat high degree of difficulty, students are sometimes only able to plan, but have not been able to use or apply the formula to a problem .
Can students demonstrate the process of solving a problem?	Students in grade IV, V and VI have been able to provide the right reasons in determining the plan to solve a problem.
Can the student check back the calculations that have been done?	Students in grade IV, V and VI have applied re-read questions in checking the answer of a problem.
Can students find other alternative solutions?	The fourth grade student still can not find another alternative, whereas grades V and IV are used in using the example of solving a problem from a different source.

DISCUSSION

From the results of observations and interviews can be known how the math literacy of high school students at SD Negeri Sendangadi 1 District Mlati Sleman Regency of Yogyakarta in terms of students' math problem solving skills. From the interview result, it is known that the ability of students in solving math problems varies widely. Students often still find it difficult in performing stages in solving math problems.

4th Grade Students

Students are able to complete all the questions already given, but not all the answers are correct. Students are able to answer questions with known contexts and all relevant information is available with clear questions, able to identify information, and perform common ways based on clear instructions and indicate an action in accordance with the given simulation. Students are also able to interpret to be able to recognize contexts that require a direct conclusion. Students are able to sort information to present the data and provide the exact reason of the outcome. Based on it can be analyzed that the fourth graders of elementary school is at level 2 literacy mathematics.

5th Grade Students

Students are able to do all the questions given, but the results are not all right. Students are familiar with the questions in the form of context, able to identify problems for answers based on clear instructions and able to perform actions with stimulation provided. Students are able to make direct conclusions, sort information from a single answer and use a single presentation method, using formulas to include in completion and able to provide precise reasons for the outcome. Based on these things can be analyzed that the students of grade V SD are at level 3 math literacy ability.

6th Grade Students

Students are able to correctly answer questions in the form of context, identify information, solve problems with clear instructions and be able to give the right reasons for the answer. Students are getting used to doing procedures that require consecutive decisions, solving problems with simple strategies, interpreting and using representations based on different sources of information and expressing the results of their interpretations. Based on it can be analyzed that the fourth graders of elementary school is at level 3 math literacy ability.

According to the results of the research described above, it is clear that the students of grade V and IV SD are only at level 3 of mathematics literacy, while fourth grade students of SD can only be at level 1. The results of this research are supported by Department of Basic Education (DoBE, 2011) stating that the level of problem solving of grade IV to VI students is still at the level of solving problems that are not visible and not routine but not necessarily difficult, higher understanding and process are often involved, and may require the ability to solve problems to the process of completion . Another research that supports the results of this study is a study by Mulyati (2016) which states that the characteristics of elementary school students who are still in the concrete operational stage, namely learning that integrates knowledge, skills, and creative thinking and more emphasis on the experience and involvement of students actively in troubleshooting.

The mathematics literacy of students is also influenced by teacher competence. Teachers should give students the opportunity to build their own knowledge and relate mathematics to problems in everyday life because understanding and the ability to use concepts in life are part of the competence of mathematical literacy. This is supported by the research of Nugroho (2017) which states that to increase students' mathematical literacy, teachers need to provide strengthening in the form of exercises math literacy problems so that students' math literacy at high PISA's level 4, 5 and 6 can be achieved.

Teachers are also expected to examine systematic weaknesses and errors in students' mathematical understanding. Errors and weaknesses of students can be used as a basis in planning future improvements. Teachers should seek to develop students' thinking skills so that students' abilities are not limited to routine questions but gradually get used to non-routine questions with multilevel levels. The more teachers challenge students to solve more PISA-based math problems, so students will often extract mathematical information from real-world problems. By providing opportunities for students to engage in real-world problems will serve to make mathematics more relevant to students, and provide opportunities to develop broader mathematical competencies, and to enhance students' knowledge of mathematical literacy. As the Center for Education Statistics and Evaluation (2016) has pointed out, effective teachers have a strong literacy knowledge base that is able to create broad teaching strategies according to the context, objectives and needs of the students and be able to take advantage of environments that support literacy improvement.

Thus, the role of teachers in improving students' mathematical literacy skills is to assist students in building positive perceptions of mathematics.

CONCLUSION

Based on the above discussion, it can be concluded that the high school students who are the subjects in this study, whether class IV, V, or VI, are still not familiar with the problems or problems that require logical thinking and applicative solutions. They are still familiar with procedural and concrete answers, so there needs to be other strategies used to familiarize students in dealing with problems or problems that require logical reasoning that support students' mathematical literacy.

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