Vocational High School Students Ability In Mathematics Literacy

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ABSTRACT

Mathematical literacy is a person’s ability to formulate, apply, and interpret mathematics in various contexts. This study is a qualitative descriptive that aims to describe the ability of mathematics literacy of students in the subject of exponents and logarithms in Vocational High School. Data analysis is done by collecting data, reducing data, and verifying data. The results obtained in this study are subjects with values above the MEC can solve the problem by using information, performing representations based on concepts, using procedural knowledge in the form of algebraic manipulation in accordance with the nature of exponents and logarithms, and can connect it with the real world to determine the outcome of completion, according to level 4 PISA. Subjects with the same value as MEC can solve problems, interpret by using the properties of exponents and logarithms, and implement procedures according to the 3rd level of PISA. Subjects below the MEC can only solve commonly resolved problems using simple properties, corresponding to the PISA 1st level.

INTRODUCTION

Good learning should no longer position teachers as a primary learning resource. Students must use various other learning resources to develop their abilities. In the 21st century, learning should integrate literacy skills, knowledge skills, skills and attitudes, and technological mastery (Kemendikbud, 2017: 4). Students who can perform maximum literacy activities will get more learning experience compared to students who do not develop reading skills. Literacy is the most important part of the learning
process. The literacy skills applied should be integrated into every subject, including mathematics. Mathematical literacy is important because mathematics is a way of finding answers to problems facing humans and related to how to use information (Hasratuddin, 2014). A person who has the ability to read mathematics can interpret data, solve everyday problems, reasoned in numerical, graphical, and geometric situations, and communicate using mathematics (Ojose, 2011).

Mathematical literacy is a high-level ability that students must possess. High-level thinking is the ability to connect, manipulate, and alter the knowledge and experience that has been possessed for critical and creative thinking in the effort to make decisions and solve problems in new situations (Rofiah, Siti, & Ekawati, 2013). Knowledge and understanding of mathematical concepts are very important but more important is the ability to enable math skills to solve problems encountered in everyday life (Johar, 2012). The mathematics used in all aspects of life is called mathematical literacy (Asmara, Waluya, & Roczmad, 2017).

Literacy ability in this research is student literacy ability. Literacy in the context of mathematics is the power to use mathematical thinking in solving everyday problems to be better prepared for life's challenges (Steecey & Turner, 2015). Mathematical literacy helps one to understand the role or usefulness of mathematics in everyday life in making decisions. Math thinking will help one to think logically and systematically. The mathematical thinking includes the problem-solving mindset, logical reasoning, communicating, and explaining. The mindset is developed based on concepts, procedures, and mathematical facts that match the problems at hand (Sari, 2015).

In addition, the ability of mathematical literacy is defined as the ability of a person to formulate, apply and interpret mathematics in context, including the ability to make mathematical reasoning and use concepts, procedures, and facts to describe, explain or estimate phenomena/events (Setiawan, 2014). A person who has good literacy skills is expected to become a citizen who builds, cares, and thinks. Students need to improve literacy through various sources and media, especially on teaching and learning activities (Wati, Sinaga, & Priyandoko, 2017).

The ability of mathematical literacy has certain levels. PISA developed six categories of students 'math skills that demonstrate students' cognitive abilities (OECD, 2014). The level of mathematical ability according to PISA is presented in table 1 below.

<table>
<thead>
<tr>
<th>Level</th>
<th>What Students Can Do</th>
</tr>
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<tbody>
<tr>
<td>6</td>
<td>Performing conceptions, generalizing and using information based on review and modelling in a complex situation, and can use knowledge above average. Connect different sources of information and represent, and run both of them flexible. Students at this level have high mathematical reasoning abilities. Applying knowledge, mastery and symbols and relationships from mathematical operations sympathy, developing new strategies and approaches to deal with new situations. Reflecting on their actions and formulating and communicating their actions appropriately and depicting their findings, interpretations, opinions, and conformity to real situations.</td>
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<tr>
<td>5</td>
<td>Develop and work with models for complex situations, identify problems, and set assumptions. Choosing, comparing, and properly evaluating problem-solving strategies related to complex problems associated with the model. Working strategically using broad thinking and reasoning, and appropriately linking representations of symbols and formal characteristics and knowledge relating to the situation. Reflecting</td>
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<tr>
<td>Level</td>
<td>What Students Can Do</td>
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<tr>
<td>4</td>
<td>Work effectively with models in concrete but complex situations that may involve restrictions to make assumptions. Selecting and combining different representations, including symbols, links it to real situations. Use his limited skills and express the reasons with some views in clear contexts. Giving explanations and communicating them with arguments based on their interpretations and actions.</td>
</tr>
<tr>
<td>3</td>
<td>Implement procedures clearly, including procedures that require consecutive decisions. Solve problems, and implement simple strategies. Interpret and use representations based on different sources of information and propose the reasons directly. Communicate the results of their interpretation and reasons.</td>
</tr>
<tr>
<td>2</td>
<td>Interpret and recognize situations with contexts that require direct conclusions. Sort out relevant information from a single source, and use a single serving method. Work on basic algorithms, use formulas, execute procedures or agreements. Give precise reasons for the outcome.</td>
</tr>
<tr>
<td>1</td>
<td>Answering questions with known contexts as well as all relevant information are available with clear questions. Identify information, and perform common ways based on clear instructions. Shows an action according to the given simulation.</td>
</tr>
</tbody>
</table>

Mathematical literacy is a government program that must be implemented by every educational unit from basic education to higher education, as well as in vocational high schools. Vocational schools are vocational education units that develop the ability in accordance with their respective learning programs, but it is also expected to develop literacy skills.

Literacy has been in effect since 2015 until now. One of the schools in Banyumas Regency that have implemented this literacy program is Telkom Sandhy Putra Purwokerto Vocational High School. The phase of the implementation of school literacy activities there is three stages, namely the stage of habituation, development stage, and learning phase (Widyani, Widyanto, Rahayu, and Kusumo, 2016). In accordance with the guidance of the school literacy movement, Telkom Sandhy Putra Purwokerto Junior High School has also participated in these stages. The first stage that has been implemented in the school is to grow reading interest through a fifteen-minute activity in accordance with Permentikbud. 23 of 2015. The second stage is to improve literacy skills through enrichment book building activities. The third stage is to improve literacy skills in all subjects: using enrichment books and reading strategies in all subjects.

The existence of a school literacy movement implemented at Telkom Sandhy Putra Vocational High School that has reached the third stage of student literacy has increased. So students have a willingness to read high outside the given subjects. With these conditions, the question arises whether the literacy ability of students to mathematics subjects also increased. In addition, improving students' math reading skills have reached the last level in line with government expectations. To answer the question, this study aims to determine the ability of students' mathematics literacy in Vocational High School.

**METHODS**

The study is qualitative with case study strategy which objective to know the students vocational high school ability of mathematics literacy. Qualitative researchers begin with a self-assessment and reflections about themselves as a historical context (Choy, 2014).
The case of study is one of the strategies and methods of qualitative analyzing data that emphasizes on special cases that occur in the object of analysis, techniques of study case analysis also use descriptive analysis strategies in analyzing data (Bungin, 2014: 237). This study was conducted in several stages, there are data collection and data analysis. This subjects of this study are three students of Telkom Sandhy Putra Vocational High School. This study chose the students who have the different achievement based on Minimum Exhaustiveness Criteria (MEC) on the subject of exponent and logarithm. Samplings in this study used stratified random sampling technique. There were 38 students in class X RPL 3 at Telkom Sandhy Putra Purwokerto Vocational High School, after conducting test on exponent and logarithmic subject, students were grouped into three groups namely students get value above MEC, students who get the same value with MEC, and students who get value under MEC.

This study used test and interview method data to collect data. The test in this study used question based on level of mathematics literacy. Before the test gave to the subject, it has been validated by content validity and reliability. The test in this study used to know level of ability students mathematics literacy. To check the validity of the test data, researcher give an interview to each subject. The interview on this study is in-depth interview, that has been validated by content validity. Researcher gave question about how the subject solve the problem of the test.

The techniques of analyzing data in this study were done by describing or explaining the data that have been collected by test and interview. This research used technique of triangulation method. Triangulation was performed by the purpose to get the testing validity of information because it could not be done by statistical tests (Bungin, 2014: 261). In this study, triangulation method obtained from the test and interview aimed to get valid data.

RESULTS AND DISCUSSION

The test is a learning achievement test on exponential and logarithmic subjects. After the test, there is an interview with the selected subject. The number of subjects is three students who get the score above the MEC (S1), a student who gets score the same as the MEC (S2), and student who gets the score under the MEC (S3). Based on the tests and interviews obtained the following data.

1. Subject who gets score above MEC (S1)

Based on the results analysis, students who scored above MEC (S1) able to work on the problem up to level 4. S3 can answer the problem that measures the ability of literacy level 1 mathematics correctly. S1 is able to meet all indicators on the ability of literacy level 1 math. S1 can answer questions with a known context and all relevant information is available with a clear question. S1 can identify information, and perform common ways based on clear instructions, it is based on the results of interviews with S1. S1 able to show an action in accordance with the given stimulus.

S1 able to answer correctly the problem that can measure the ability of math literacy at level 2. Based on test results and interviews indicate that S1 meets all indicators on level 2. S1 can interpret and recognize situations with contexts that require a direct conclusion. Based on interviews with S1, S1 is able to sort out relevant information from a single source and use a single presentation method. Understanding the use of rank and logarithms is also good. S1 can provide the reasons directly and make the correct interpretation, it appears in the interview results.

S1 able to answer questions that measure the ability of mathematics literacy at level 3 correctly and able to meet all indicators at level 3. S1 can carry out procedures clearly, including procedures that require consecutive decisions, it is seen in the results of interviews with S1. S1 is able to solve problems and apply simple strategies, be able to interpret and use representations based on different sources of information,
and can reveal the reasons directly based on the interview results. Based on the results of further interviews with S1, S1 able to communicate the interpretation results and their reasons clearly.

S1 able to answer questions that measure the ability of mathematics literacy on level 4 correctly and able to meet all indicators at level 4. S1 can work effectively with the model in concrete but complex situations involving restrictions to make assumptions. S1 can choose and combine different presentations, including symbols and connect them to real situations. S1 may use a limited range of skills and present reasons with some clear contextual views, this is apparent at the time of the interview with S1. Based on interviews with S1, S1 is able to provide explanations and can communicate it accompanied by arguments based on their interpretations and actions when solving the problem at level 4.

S1 does not do a problem that can measure the ability of level 5 and level 5 mathematics literacy. Based on interviews S1 answered cannot do the problem because it cannot interpret what must be done to solve it. S1 cannot find a strategy, cannot identify a problem, and cannot set assumptions. S1 also cannot reason and represent the symbols and cannot connect using compatibility with real situations. Based on the above, the S1 does not meet the mathematical literacy ability indicators at level 5 and level 6. Based on the exposure S1 is at level 4 mathematics literacy.

2. Subject who gets the same as MEC (S2)

Based on the results analysis, students who get the same value with MEC (S2) can work up to the problem that can measure the ability of math literacy level 4. S2 can answer the problem that can measure the ability of literacy math at level 1 correctly. Based on the answers S2 is able to answer questions with known contexts as well as all relevant information is available. S2 is able to identify information and perform common ways based on clear instructions. Based on the results of interviews with S2, S2 can show an action in accordance with the stimulus provided. So that S2 has met all the indicators in level 1.

S2 is able to answer correctly the questions that can measure the ability of math literacy at level 2. Based on the results of answers and interviews, the S2 is able to meet all indicators at level 2. S2 is able to interpret and recognize situations with contexts that require a direct conclusion. Based on an interview with S2, S2 can sort the relevant information from a single source, and use a single presentation. S2 is able to use the properties and rules well. S2 is able to provide a direct reason and do the actual interpretation in answering the question, it appears in the results of interviews with S2.

S2 can correctly answer questions that measure the ability of mathematics literacy at level 3. Based on the results of the S2's answer is able to meet all indicators at level 3. S2 is able to perform procedures clearly, including procedures that require consecutive decisions. S2 can solve problems and implement simple strategies and can interpret and use representations based on different sources of information. Based on the S2 interviews it can directly state the reasons for solving the problems used. S2 is also able to communicate the results of interpretation and reason in solving the problem. So that S2 has met all the indicators at level 3.

The S2 answer to a problem that can measure the level 4 math literacy ability is wrong. When the researcher confirmed the answer to S2, S2 said that he did not know. S2 actually knows that what it takes is to use properties at rank numbers and logarithmic properties, but S2 says do not know how to use them. Based on this the S2 does not meet indicators of level 4. The S2 also cannot answer questions that measure the ability of mathematics literacy at level 5 and level 6. In addition, S2 is also unable to meet the indicators at each level. It is apparent in the interview that S2 really does not know how to solve these problems.
Based on the results of answers and interviews, S2 is only able to meet the indicators to level 3. It is also in accordance with the analysis conducted by researchers. So that S2 is on the ability of math literacy at level 3.

3. Subject who gets score under the MEC (S3)
   Based on the results analysis of students who scored under the MEC (S3) is able to answer correctly the problem that can measure the ability of math literacy level 1, in addition, S3 able to meet all the indicators of literacy ability level 1 math. S3 able to answer questions with a known context and all relevant information is available with clear questions, it is based on S3 results. S3 is able to identify information and perform common ways based on clear instructions, it appears on the results of S3 identification on the problem. S3 is able to show an action according to given stimulus, it is appropriate seen in the result of an interview with S3.
   
   On the question of measuring the ability of level 3 math literacy, S3 can only write what is known in the question. At the time the researcher provoked answers from S3, S3 said that he did not know. S3 is still confused to answer the problem that can measure the ability of level 2 math literacy, it is seen in the results S3 answers and the results of interviews with S3. Based on this S3 does not meet all indicators in level 2.

   S3 does not answer the questions that can measure the ability of math literacy level 4, level 5, and level 6. At the time the researchers conducted an S3 interview said that he did not know. S3 also does not meet the indicator at level 4 to 6. Based on it S3 only meets the indicators at level 1 only. This is also in accordance with the results made by researchers so that S3 is at level 1 literacy mathematics.

CONCLUSION
Based on the discussion, it can be concluded that the students' ability of mathematics literacy in Vocational High School as follows.
   a. Subjects with values above the MEC can solve the problem by using information, performing representations based on concepts, using procedural knowledge in the form of algebraic manipulation in accordance with the nature of exponents and logarithms, and can connect it with the real world to determine the outcome of completion, according to level 4 PISA,
   b. Subjects with the same value as MEC can solve problems, interpret by using the properties of exponents and logarithms, and implement procedures according to the 3rd level of PISA, and
   c. Subjects below the MEC can only solve commonly resolved problems using simple properties, corresponding to the PISA 1st level.

REFERENCES


