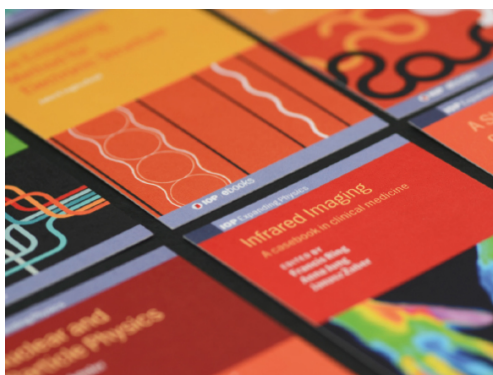


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# Mathematical literacy ability of the elementary school teacher education program of the students' of Universitas Negeri Semarang

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**Abstract.** Mathematical literacy ability is the ability to formulate, apply and interpret mathematics in various contexts. This ability can help someone in applying mathematics to solve problems in daily life. This paper aimed to understand the mathematical literacy ability of the students of The Elementary School Teacher Education Program of Universitas Negeri Semarang. The data analysis was done by referring to the qualitative data model by Miles and Huberman. There are data reduction, data display, and conclusion/verification. The results are 75,57% of the students can formulate daily life problems into mathematical problems, 54,96% of the students have used logical reasoning, 36,64% of the students can draw a conclusion, 29,01% of the students can give an evaluation of the conclusions made.

## 1. Introduction

Indonesian government is actively campaigning literacy movement in schools. With so much unclear information on the internet and the low ability to read carefully, people often have different opinions and tend to spark conflict from those differences. One thing that is regulated in Permendikbud Number 23, 2015 about Character Development is 15 minutes non-core subject reading before the lesson begins. It is considered that it can grow the reading interest and increase the reading skill so that the knowledge can be mastered better. The government tried to grow a love-to-read people by doing School Literacy Movement (SLM), People Literacy Movement (PLM), and National Literacy Movement (NLM). Indonesian Government is paying attention to literacy by doing campaigns to those movements. Why is that? Reading may be an easy thing to do, but it is hard to be a habit [1]. A good reading skill will make people understand the information that they got better and process them by thinking about the truth from that information. So, people will not accept unknown truths. They must think first and find out whether the information is true or false. So, they will not get fooled by false news. Many students looked directly after a research without paying attention to the process. It is a very simple thing that can cause a fatal effect on the next research writing. Imagine if someone wants to experiment in a lab without the whole procedure. It may lead to some unwanted results [1]. Reading skill is very important for students, including the students of Elementary School Teacher Education Program of Universitas Negeri Semarang. Literacy was viewed only as an ability to read and write. The term literacy brings first to mind, a shallow definition, comprising reading and writing skills [2]. Nowadays, the meaning of literacy is wider. Literacy is a complex process that involved previous knowledge, cultures, and experiences to develop new knowledge and deeper understanding [3].

Literacy widely spread into several aspects including mathematics. Mathematical literacy is one of mathematics ability [4]. Mathematical literacy becomes a topic in mathematics education that goes



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beyond curricular mathematics and encompasses a broader conception of what constitutes mathematics [5]. In particular mathematical literacy was interpreted as an individual's ability to solve a situation related to mathematics [6]. Mathematics literacy is the knowledge to know and apply basic mathematics in our everyday living [7]. Mathematical literacy can drive someone to considerate and understand the use of mathematics in daily life [8]. To put it simply, mathematical literacy can be seen as the ability to understand and use mathematics in various context to solve problems, and able to explain to others how to use mathematics [3]. That mean, someone who has a mathematic literacy skill can read or listen, write or speak, and has mathematical knowledge to be used in understanding, solving problems, and communicate it [3]. Mathematical literacy as Discourse provides a broad view of how mathematicians communicate [9]. Mathematical literacy (mathematical literacy) is about usability or mathematical functions that have been learned by the students in the school to everyday life in order to compete in a globalized world [10]. When the literature is examined, it is possible to come across studies that indicate the importance of mathematics literacy for teaching processes and learners [11]. Mathematical literacy became one of the components necessary to build 21-st century skills [12]. So, the writer wanted to know the mathematical literacy ability of the students of Elementary School Teacher Education Program of Universitas Negeri Semarang

## 2. Method

This kind of research is a qualitative research with descriptive qualitative approach. The subjects of this research are the students of The Elementary School Teacher Education Program of Universitas Negeri Semarang in the first semester in base mathematics concept class. From 10 existing groups, four were picked randomly. The amounts of the member in those four groups are 131 students. The data-gathering techniques in this research are written text and interview. The data credibility test in this research was done by the triangulation method which is matching the test result data with the interview result data. The data analysis was done by referring to the qualitative data model by Miles and Huberman, which are: data reduction, data display, and conclusion/verification.

The test result in this research is the early mathematics abilities in set subjects. The interview was done after the test was over. The result was done to twenty students. Those twenty students were chosen by test result that has been done. Five students got high scores, ten students got average scores, and five students got low scores. The interview result was used to support the written test result. To test the informants' data credibility in solving the given problem, the researcher used the triangulation method by matching the test result and the interview result. When the result of the triangulation showed that there is consistency between the answers with the interview results, then the data is valid or credible. Then to determine every informants' problem-solving, work results data or interview was used.

## 3. Result and Discussion

One of the international organizations that assess the ability of mathematical literacy is the OECD (Organisation for Economic Cooperation and Development through PISA (Programme for International Student Assessment)). PISA is an international level assessment assessing the knowledge and skills of 15-year-old students [13]. The assessment of PISA includes mathematical literacy, reading literacy, and scientific literacy [14]. Mathematics literacy is emphasized three the ability to formulate, employ, and interprets [13]. The process of mathematical PISA is similar to the process of mathematical modeling [9]. Mathematical modelling starts with an extra-mathematical world problem [15]. Process in mathematics literacy can be categorized into four main processes namely formulating the real problems, using mathematics, interpreting, and evaluation solutions. A person who has good literacy skills can go through these four processes in solving problem well too [16]. Mathematical literacy ability in this research is mainly seen by the ability to read, write and having mathematical knowledge to be used in understanding, problem-solving, and communicate it in the form of writing. Because of the limitation, this paper cannot see the ability in mathematic verbal communication in detail. It is because the interview was done only to twenty students. The mathematical literacy process is started from translating daily life problems into mathematical problems, then implement mathematical knowledge to solve those mathematic problems and interpret the conclusion.

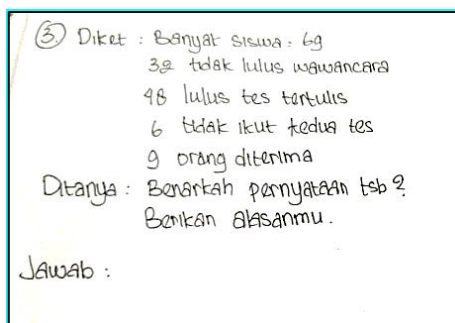
69 students have to take a written test and interview test to be accepted as a student council member. It turned out that 32 students passed the interview test, 48 students passed the written test, and 6 students did not take the two tests. Many students who are accepted as student council members are 9 people. Is that statement true? Give your reasons! This problem was given as an early mathematics ability test.

From the test result the writer conclude some facts. The first fact is almost all students are able to write what they know and what they were asked. From 131 students, there are 99 students that write they know and asked in a correct mathematic sentence. After conducting the interview, where five students in high and 10 students in the average score group can easily translate the daily life problems into mathematical sentences verbally with ease, the other five students in the low group must be guided by the lecturer first. Three of them reasoned not careful in reading the problem while the others are rushing to work on the problems.

The second fact, all students have done the mathematics problems. 72 students started from what they know, draw the Venn diagram, build mathematics modelling then do the calculations. That means those 72 students have logical reasoning in solving those mathematic problems. From those twenty students, 7 students from the average group and three students from the low group admitted that they forgot to draw Venn diagram. 3 students in average group and two students in low group only draw the diagram Venn and don't know how to write the mathematics process of the problem.

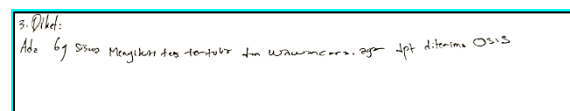
The third fact, the students are not used in writing conclusions from their problem-solving results. From 131 students, there are only 48 students that write their conclusion for their problem-solving results. Based on the interview, 8 students in the average group and five students in the low group forget to write the conclusion. Two students in the average group and five students in the high score group write the conclusion correctly.

The fourth fact, there are around 38 students give the correct answer from the wrong statement. Based on the interviews, three high score person said he answered the problem by checking the truth of the statement. While two other people said he wanted to know the correct answer after assuming that the statement was wrong.



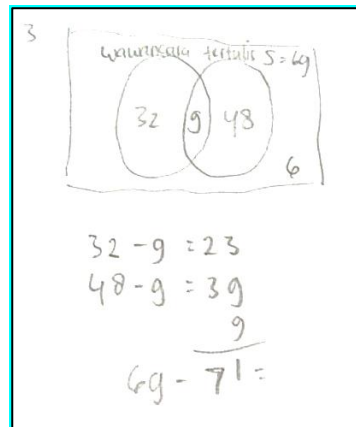
③ Diket : Banyak siswa : 69  
 32 tidak lulus wawancara  
 48 lulus tes tertulis  
 6 tidak ikut kedua tes  
 9 orang diterima  
 Ditanya : Benarkah pernyataan tsb ?  
 Berikan alasanmu.  
 Jawab :

**Figure 1.** A student's answer that has written everyday problems into mathematical problems



3. Diket:  
 Ada 69 siswa mengikuti tes tertulis dan wawancara. 32 spt diterima OSIS

**Figure 2.** A student's answer that does not write down the problem

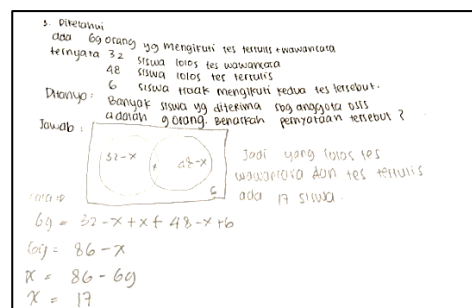


**Figure 3.** A student's answer that forgot to write down the problem

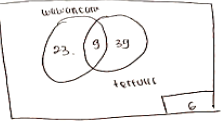
In other word, from the first fact, we can say that only around 75.57 % that can translate daily life problems into mathematic sentence. While the rest still need guidance. There are three possible answers given by students. First, they knew what was written. Figure 1 is an example of the answers of students who have written everyday problems into mathematical problems. Secondly, they did not know what to write. Figure 2 is an example of a student's answer that does not write down the problem. Thirdly they are not used to it or forgot to write it. So they immediately work on the problem. Figure 3 is an example of the answers of students who forgot to write down the problem. Based on the observation, the most common difficulty for the students to solve is story-based question [17]. Students' understanding of mathematics sentences is an important thing. Understand the aspects of the problem related to known problems, mathematical concepts, facts or procedures[18]. It is because in daily life, many problems must be solved mathematically where the solutions need some skills in understanding the relationship between sentences, numbers, and symbols [19]

The second fact says that only 54.96% of students can solve the problems with a logic reason, while the rest of the students directly do the calculations without drawing a Venn diagram or build mathematics modelling. They cannot represent everyday problems into a diagram. That means those students cannot communicate what they do textually yet. Learning mathematics is not all about mastering concepts in mathematics but also applying the concept in solving daily life problems [20].

The third fact says that 36.64% of the students considered that communicating the conclusion is an important thing to do. If they didn't write the conclusion then the students considered that the conclusion is not an important thing to communicate. Figure 4 is an example of the answers of students who have not written the conclusions of the problem. The students with the average problem- solving skill answer correctly but not thoroughly when they did not give the conclusion and even in some questions, they did not give the information from the problems [21]. The reason is that students are less scrupulous and often students do not write a conclusion on the results of the answer, he just wrote the final result of the calculation operation [22]



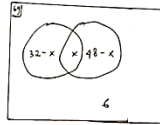
**Figure 4.** A student's answer that has not written the conclusions of the problem

Diketahui :  
 - 23 siswa mengikuti tes terentu dan wawancara  
 - 9 siswa ikut wawancara dan terentu  
 - 39 siswa ikut wawancara  
 - 6 siswa mengikuti tes saja  
 Ditanya :  
 Berapa pemecahan tsb.  
 Berapa alasannya.  
 Djawab :  
  
 Pernyataan Jumlah siswa yang harus mengikuti tes terentu dan tes wawancara tersebut adalah salah  
 karena siswa yang mengikuti tes terentu dan wawancara harusnya berjumlah 77 siswa  

$$\text{Jumlah} = 23 + 9 + 39 + 6$$

$$= 77 \text{ siswa}$$
 Jadi pernyataan tsb salah.

**Figure 5.** A student's answer that has written the conclusion of a problem

Diketahui :  
 - Jumlah siswa = 69  
 - lulus wawancara = 32  
 - lulus terentu = 48  
 - tidak keduanya = 6  
 - diterima anggota = 9  
 Ditanya : Benarkah pernyataan yang ada di soal tersebut?  
 Jawab :  
 Diagram Ven  
  
 Cara  $\rightarrow 69 = 32 - x + x + 48 - x + 6$   
 $69 = 86 - x$   
 $x = 86 - 69 = 17$   
 Jadi, yang lulus tes keduanya adalah  $x = 17 \rightarrow$  yang diterima anggota.  
 Maka pernyataan tersebut tidak benar, karena yang diterima anggota adalah 17 bukan 9

**Figure 6.** A student's answer that has written the conclusion of a problem while providing the correct answer

The fourth fact says that 29.01% of students that are used to evaluate the result of their problem-solving. Figure 5 is an example of a student's answer that has written the conclusion of a problem. Figure 6 is an example of a student's answer that has written the conclusion of a problem while providing the correct answer. Both of them were the correct answer. But the students who solve the problem by giving the correct answers besides evaluating statements have stronger reasons. To be good at mathematics, a student needs to develop an understanding of concepts, become fluent at procedures, be able to reason, and have the ability to strategize these components [23].

#### 4. Conclusions

The results are 75.57% of the students can formulate daily life problems into mathematical problems, 54.96% of the students have used logical reasoning, 36.64% of the students can draw a conclusion, 29.01% of the students can give an evaluation of the conclusions made.

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