Analysis of mathematics literacy ability of elementary school teacher education students

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Abstract. The purpose of this study is to describe and describe abilities mathematical literacy of elementary school teacher education students in the material of system of square inequalities in two variables. The analysis shows that most elementary school teacher education students were not equipped with the skills and knowledge that were prerequisites for action. Many students of elementary school teacher education used informal methods to solve problems. The indicators of mathematical literacy ability analysed include: formulate real problems in problem solving, use mathematics in problem solving, interpret solutions in problem solving and evaluate solutions in problem solving. The data collection technique used in this research is test technique. The validity of the data used triangulation techniques and data analysis techniques used data reduction, data presentation and conclusion drawing. The lowest percentage acquisition of 10.51% means that some students have not been able to evaluate the solution of the questions that have been given. The highest percentage of 19.27% means that during work, the students are able to formulate the real problems contained in the questions. The results of this study indicate that there are four abilities that must be met by students to have literacy skills in problem solving.

1. Introduction
In the era of the Industrial Revolution 4.0, the ability that everyone, especially students, must have is to be able to respond quickly in managing developing information. This ability is literacy ability. Students must understand and master 21st-century literacy which emphasizes data-based knowledge, technology, and humanism, not just reading, writing, and arithmetic skills.

Mathematical literacy in the 2012 Mathematics PISA framework is defined as an individual’s ability to formulate, use, and interpret mathematics in various contexts. Including the ability to reason mathematically and use concepts, procedures, facts, as a tool to describe, explain, and predict a phenomenon or event. Mathematical literacy can help individuals to recognize the role of mathematics in the real world and as a basis for consideration and decision making needed by society [1]. Mathematical literacy involves seven basic skills that must be possessed, namely: (1) Communication, the ability to communicate problems; (2) Mathematising, the ability to change problems from the real world to mathematical forms or vice versa; (3) Representation, the ability to present a mathematical problem again; (4) Reasoning and Argument, the ability to reason and give reasons; (5) Devising Strategies for Solving Problems, the ability to use problem-solving strategies; (6) Using Symbolic, Formal and Technical Language and Operation, the ability to use symbolic language, formal language,
and technical language; (7) Using Mathematics Tools, the ability to use mathematical tools, for example in measurement [2].

Mathematical literacy is defined as the ability to use mathematical knowledge and understanding effectively in facing the challenges of everyday life, in other writing, literacy is defined as a person's ability to formulate, apply, and interpret mathematics in various contexts, including the ability to do reasoning, mathematically and use concepts, procedures, and facts to describe, explain or predict phenomena/events [3-5].

Low mathematical literacy skills can be seen from the algebraic operations carried out by students on the following two-variable square equation material $3a^2 + b + 2a^2 - 3b + 2$, students are able to simplify this mathematical expression correctly, because it is a routine problem that they are used to doing. However, when given non-routine questions, such as, $2x^2 + 3y$, $2 + b$, and $3x^2.2y$, it appears that students do not yet understand how to operate the real algebraic form. Students answered incorrectly and could not state reasons why they gave such answers. his case implies the students’ low ability to apply their knowledge and understanding.

For mathematical literacy ability to develop properly, it is necessary to analyze mathematical literacy ability based on the indicators. This article presents the results of an analysis of the mathematical literacy ability of elementary school teachers education students.

2. Methods
This type of research uses qualitative research because researchers analyze students' mathematical literacy skills in problem-solving PISA type problems for students of elementary school teacher education. In this study, the method used in the qualitative analysis of the Miles and Huberman model includes data reduction, data display/presentation, and verification/drawing conclusion. While the validity of the data in this study used data triangulation. The research subjects were elementary school teacher education students.

The data in this study are in the form of observational data. The results of student tests and also interviews with students as research subjects, through student work, students can solve the problems used by the research to clarify their mathematical literacy skills in solving problems achieved by students.

3. Results and discussion

One of the student learning outcomes in elementary school teacher education in Mathematics Education is having an understanding of the concepts and learning processes of mathematics that are by students' cognitive readiness. Elementary school teacher education students must also realize that the mathematics learning process at the elementary school level requires representative mathematical literacy skills to assist students in learning mathematical concepts and procedures.

There are four indicators of mathematical literacy ability. The four indicators are formulating real problems in problem-solving, using mathematics in problem-solving, interpreting solutions in problem-solving and evaluating solutions in problem-solving. The percentage can be seen on table 1.

| Indicators of Mathematical Literacy Ability   | Percentage |
|-----------------------------------------------|------------|
| Formulate real problems                       | 19.27      |
| Using math                                    | 17.23      |
| Interpreting the solution                     | 13.45      |
| Evaluating solutions                          | 10.51      |

This study was conducted on 15 students, with the research subject namely student X. Student X's analysis of the level of mathematical literacy skills can be seen in the following figure. Formulate real problems and construct mathematical models. In this section, students are able to formulate real problems and building basic skills in understanding problems, students can write down the information
contained in the questions, here are the answers of students supported by the results of interviews that show students are able to formulate real problems and compile mathematical models in problem-solving. The questions are given as following: a person is said to have an ideal body weight if the person's weight is more than or equal to the height minus 24 units and the height plus 4 units are more than or equal to the square of body weight. Express the problem in the quadratic inequality system and determine the area of the solution! The students' answers are shown in the following figure 1.

From figure 1 the results of student X's work in Figure 1 show that the subject can solve problems with communication skills. However, at the time of the interview, student X said that the mathematical symbol was not accurate, namely saying the symbol "≤" was less than and the symbol "≥" was more than. Able to meet mathematical skills, problem-solving strategies. However, in drawing there are mistakes in explaining how to draw a sketch, namely at the point (-2,0) -2 right, 0 middle, it should be -2 left, 0 middle. Able to use correct and correct operations and symbols and be able to solve problems by providing conclusions.

The results of student Y's work in Figure 2 show that the subject can solve problems on communication skills, mathematical abilities, problem-solving strategies. However, in the strategy, there is a section at the intersection point that has not been fulfilled, namely in the part of substituting the x value obtained...
from the formula $x = \frac{b}{2a}$ into the second inequality $y + 4 \geq x^2$, which is also able to use good and correct operations and symbols.

Figure 3. The results of student Z's work.

The results of student Z's work in figure 3 show that the subject can solve problems on communication skills, mathematical abilities, problem-solving strategies. But the strategy cannot provide and explain the intersection steps precisely, namely, the second inequality $y + 4 \geq x^2$ does not answer the intersection point of the inequality and the point test not answered. Formed. The ability to determine strategies for solving problems, using operations and symbolic language, formal language and technical language and reasoning is shown by writing the steps to work on, namely determining the intersection point, the vertex, and the point test and being able to use operations and be able to give conclusions. Whereas Student Y can answer 4 literacy skills, namely communication skills, mathematics, determining strategies to solve problems, using operations and symbol language, formal language, and technical language. Student Y does not have reasoning skills. This shows that Student X is better than Student Y.

Student Z can solve the questions given by the researcher, although in answering in the answer sheet and when explaining when in the interview several mistakes occurred. able to answer 3 literacy skills, namely communication skills, mathematics, shown by writing down what is known, asked and the mathematical model formed. The ability to determine strategies to solve problems is shown by writing the steps to work on, namely determining the intersection point, the peak point. so it can be concluded that student x has the best mathematical literacy skills.

From the data analysis regarding the results of the work and the results of interviews with students, the researcher obtained data about the types of mathematical literacy skills in solving problems in PISA type questions. The abilities possessed by students are as follows:

3.1. Formulating real problems
In this ability students have not been able to formulate real problems and compile mathematical models on the problems given. It was proven by the students had not been able to write down the information contained in the questions, the students did not write what was known, what was asked, and how to answer, these points are important in formulating real problems and compiling mathematical models on the problems given. In this study, it shows that student A is less literacy in working on the questions given, a lack of understanding of the problem and evaluating solutions or checking again is the cause of the student's lack of literacy. The behavior of understanding problems by reading in problem-solving will greatly affect the literacy process. The most errors in understanding the questions are due to the problem of the subject who does not understand and know the concept, meaning that the ability to understand questions in students is very influential on the student literacy process. Students with high academic abilities, especially in the field of mathematics, in the problems of the PISA type on the ability
of mathematical literacy in problem-solving can formulate real problems, can use mathematics or use appropriate formulas, and can evaluate solutions or recheck the work that has been done. is a mathematical literacy ability in solving problems on the high PISA type problems that are owned by students [6].

3.2. Using mathematics
In this ability students can use mathematics, students can write the formulas that will be used in working on the given questions, then students can also write down the mathematical model, it is proven that student X on the LKS can use the correct formula. In working on the questions and from the results of interviews, students were also able to reveal the formulas used and where the formulas were obtained. Zulkardi [7], that when given questions on the PISA type students can develop well, students can get information from the questions given, some students are also able to write their mathematical models. but some students still have difficulty writing their mathematical models. In this study students can understand the problem, we can use mathematics and implement it, students can be literate at a moderate or moderate level, and in the interviewed student X is also quite literary or intermediate, this is in line with the grouping of levels of mathematical literacy skills according to the indicators, namely: not literary, less literary, enough literary, and literary.

3.3. Interpreting solutions
In this ability student A can interpret the context of the problems given, students who can formulate real problems can also interpret solutions to problems given proven in interviews with student A, can interpret solutions well, and with correct answers. Students who have good problem-solving abilities will have good mathematical literacy skills as well. In this study, PISA type questions can have a positive impact on the mathematics learning process, that students who work on PISA type questions have a positive impact on the students' mathematical literacy skills [8].

3.4. Evaluating solutions
In this ability students have not been able to evaluate the solution of the interpreted solution, students have not been able to check again. The results of student A's work indicate that students have not been able to evaluate the solution to the PISA questions that have been given. It can be seen that student A has been able to work on the questions but student A has not been able to evaluate the solution of the problems that have been worked on. The results of student work are also influenced by formulating real problems and using mathematics in working on PISA questions, but at this stage, students are not able to evaluate solutions or conclude from what has been done in PISA type questions. Students are only able to work with the correct formula. Teacher strategies or learning methods used by teachers also greatly affect students' mathematical literacy skills. This is in line with research conducted by Mustofa which states that teaching problem-solving increases awareness of students' knowledge and abilities during the problem-solving process. It can be said that the application of problem-solving teaching is more effective in helping students improve problem-solving performance than traditional problem-solving activities. Learning mathematics can improve mathematical literacy skills, the average score for reflection competence or evaluating solutions is 47.6 [9], the results of research in this study where the indicators evaluate the number of students who have not been able to evaluate the solution of the questions that have been worked on Waluya and Mariani [10].

4. Conclusion
Based on the results of the analysis and research results, it can be concluded that the ability of elementary school teacher education students to solve PISA questions has 4 literacy abilities in problem-solving. These abilities are as follows: First, the ability to delineate the real problem in understanding the problem. In this category, students can write and formulate real problems or can write down information. Second Ability to use mathematics to create problem-solving plans. In this category, most of the students with a literary level, in working on the questions that have been given, students can write formulas that
will be used in solving problems. Third Ability to interpret solutions in implementing problem-solving plans. In this category, some students with a less literary level were not able to solve the questions with the correct work and results, students were only able to use the formula, but in the final result, the students were not able to find the correct answer. Fourth The ability to evaluate solutions in checking back what has been done. In this category very few students can evaluate or check again, many students are still at the non-literary level, students are not able to re-evaluate the questions that have been worked on.

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