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How to improve the mathematical literacy ability of elementary school teachers education student

How to improve the mathematical literacy ability of elementary school teachers education student

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Abstract. Mathematical literacy ability is not only about mastery of the material but down to the use of mathematical reasoning, concepts, facts and tools in solving everyday problems. In addition, mathematical literacy ability also requires someone to communicate and explain the phenomena with mathematical concepts. So that everyone must have this mathematical literacy ability. How to improve mathematical literacy ability for elementary school teacher education student?. One of the alternative solution is to use virtual based mathematics kits. This article describes the use of virtual based mathematics kits to improve mathematical literacy ability.

1. Introduction

One of the main factors affecting student knowledge is the ability of teachers to carry out the learning process. Mastery of the learning process is influenced by the teacher's ability to understand the material, learning models, and the abilities that will be achieved by students. Mathematical literacy is an ability students to be able to understand facts, concepts, principles, operations, and solving mathematical problems. Mathematical literacy is an individual capacity for formulate, use, and interpret mathematics in various contexts. This includes mathematical reasoning and usage concepts, procedures, facts, and mathematical tools to describe, explain, and predict phenomena. This guides the individual to identify the role of mathematics in life and creation good judgment and decision making required by constructive, reflective population [1]. Mathematical literacy has been sparked by NCTM (National Council of Teachers Mathematics). There are five competencies in learning mathematics, namely: mathematical problem solving, mathematical communication, mathematical reasoning, mathematical connection, and mathematical representation. The ability that includes the five competencies is mathematical literacy ability [2,3]. Mathematical literacy too requires someone to be able to communicate and explain a phenomenon faced through mathematical concepts.

In fact, in everyday life, students face problems related to personal, social, work, and scientific matters. Many of these problems are related to the application of mathematics. Good mastery of mathematics can help students solve these problems. The question is what kind of math skills are needed to solve problems in everyday life. Specifically, what math competencies are for 15 year olds (obtained through school or special training) that will be useful for their future careers or to continue their education to higher education. Therefore, it takes mathematical literacy which is the target of PISA [4].

Mathematical literacy is very important. This is because mathematical literacy emphasizes the ability of students to analyze, give reasons and communicate ideas effectively on the mathematical problem fractions they encounter [5,6]. With mastery of mathematical literacy, each individual will be able to reflect on mathematical logic to play a role in his life, community, and society. Mathematical literacy enables individuals to make decisions based on a constructive mathematical mindset [7-9].

To improve mathematical literacy skills, teachers, government, and education observers, and education policyholders need to first understand the subject of mathematics learners. It should be noted that the subject of mathematics learners in Indonesia has very diverse characteristics. Regarding the characteristics of these learners, Gardner has emphasized that each individual has eight intelligences summarized in multiple intelligences, namely linguistic intelligence, mathematical intelligence, spatial intelligence, musical intelligence, kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, and naturalist intelligence [10,11]. To optimize the multi-level intelligence which is very influential on mathematical literacy skills, it is better if the teacher designs learning that can stimulate student competence. One of the learning models is virtual based mathematics kits.

Virtual based Mathematics Kits are designed to present mathematical objects to be dynamic and can be easily manipulated [12]. This is expected to help students improve their mathematical literacy ability. Virtual based Mathematics Kits is development of mathematics learning media is needed in order to obtain representative mathematics learning media so students can learn mathematical concepts and procedures correctly, easily, interestingly, and fun [13]. Virtual Mathematics Kits is a collection of products from various software such as geogebra, matlab, mathway, exc. the objectives of using Virtual Mathematics Kits are to: a). Presenting math problems; b). Transforming mathematical concepts into objects that can be manipulated; and c). Provide assistance to students to make problem solving ideas.

2. Methods

This research was conducted on fifteen students of elementary school teacher education. The descriptive qualitative research method that describes virtual based mathematics kits can improve mathematical literacy ability.

3. Results and discussion

Applied mathematical literacy activities, namely formulating real problems in problem-solving, using mathematics in problem-solving, interpreting solutions in problem-solving and evaluating solutions in problem-solving. Virtual based Mathematical Kits which is used in this research is geogebra, matlab, and math way software. The material studied is equations and inequalities linear and quadratic two variables [14].

The following shows the percentage of mathematical literacy skills before and after learning using virtual based mathematics kits (see table 1).

Table 1. Percentage of result of mathematical literacy ability.

Indicators of Mathematical Literacy Ability	Percentage %	
	Before	After
Formulate real problems	19,27	88,05
Using math	17,23	87,76
Interpreting the solution	13,45	87,54
Evaluating solutions.	10,51	86,34

To see the effectiveness of the use of virtual based mathematics kits, it is shown descriptively in table 2 below.

Table 2. Means and standard deviation.

Treatment	Means	Standard Deviation
Before learning using virtual based mathematics kits.	19,73	5,79
After learning using virtual based mathematics kits..	86,53	5,06

An example of student work using virtual based mathematics kits is shown in the following figure 1-3.

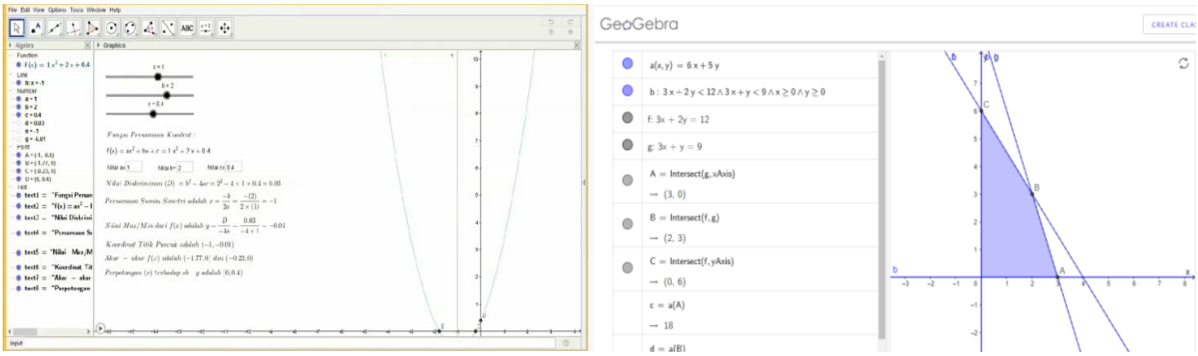

Figure 1. Geogebra.

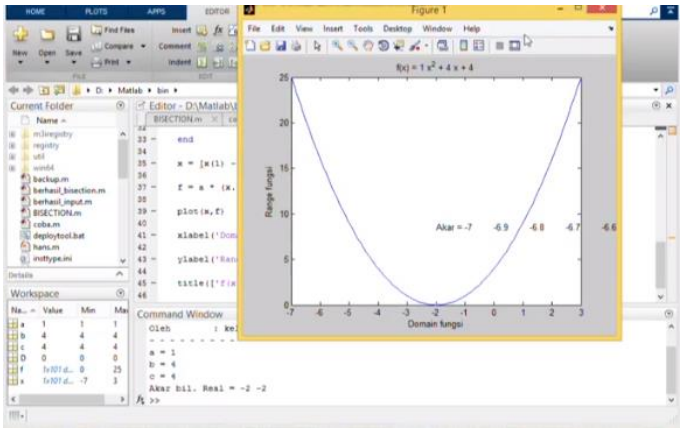

Figure 2. Mathlab.

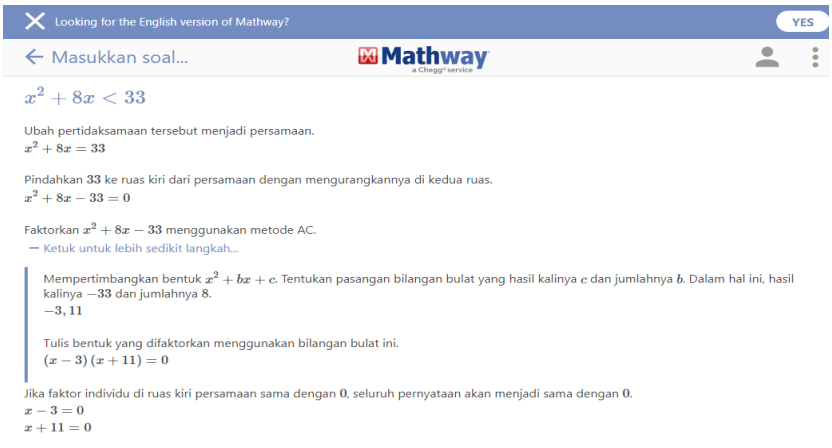

Figure 3. Mathway.

From the research results, it was found that students in doing mathematical literacy activities using virtual based mathematics kits were more stimulated in understanding mathematics concepts. Researchers conducted a preliminary test (diagnostic test) and interview each student who contracted the linear program course. The results of the preliminary tests and interviews show that students have difficulty learning about basic calculations and they are accustomed to calculating using the calculators on the cellphone. Within the allotted time for completing the initial test, not all questions can be completed on time. These learning barriers need to be solved so that students get better performance. virtual based mathematics kits are one of the e-learning tools that can contribute to improving mathematical literacy [11,15,16].

Based on indicators of mathematical literacy skills before using virtual based mathematics kits, evaluating solutions activity has the lowest percentage compared to interpreting the solution, using math, and formulate real problems. Meanwhile, the percentage of mathematical literacy skills after applied virtual based mathematics kits is almost even in each indicator. This is because understanding the mathematical concept using virtual based mathematics kits must be comprehensive.

In terms of using virtual based mathematics kits, students are very enthusiastic about using virtual based mathematics kits. Although this application is a new medium, students have high interest in the media. Some students have difficulty using virtual based mathematics kits, especially in geometric medium. However, the activities continued to run smoothly because teachers and researchers assisted students in using virtual based mathematics kits. Virtual based mathematics kits makes it easy for students to do reasoning.

4. Conclusion

Mathematical literacy is a person's ability to efficiently formulate, use and interpret mathematics in various contexts of daily life problems. Mathematics is meant to cover all mathematical concepts, procedures, facts and tools in terms of calculations, numbers and spatial. In terms of process, this ability is not only limited to the ability to count, but also how to communicate, reason and other mathematical thinking processes. These processes are summarized in the mathematical process.

Mathematical literacy skills must continue to be improved. However, in implementing the development process, one must pay attention to the uniqueness of the individual learner, in this case the tendency of his intelligence. The intelligence tendency of learners can also affect the learning styles used by learners.

Virtual based Mathematics Kits can support mathematical literacy activities. Students involved in mathematical literacy activities indeed experienced an increase in mathematical literacy skills. However, Virtual based Mathematics Kits can assist students in learning mathematical literacy. Students can learn mathematical literacy easily and optimally. The most important thing in a mathematical medium is the ability to present abstract concepts in the form of a chain. Virtual based Mathematics Kits is able to provide and presents forms that are not only concrete but also dynamic and manipulative. Therefore, in mathematics literacy-based activities it is highly recommended for use by teachers.

Acknowledgments

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