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Mathematical Literacy Skills of Junior High School Students Through Blended Learning Based on Indonesian Realistic Mathematics Education Approach

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ABSTRACT
This type of research is a descriptive study with a qualitative approach that aims to describe students' mathematical literacy skills through blended learning based on the Indonesian Realistic Mathematics Education Approach. This research was conducted in SMP Negeri 40 Palembang and the research subjects were 7 graders with a total of 35 students. The implementation procedure in this study consisted of three stages, namely the preparation stage, the implementation stage, and the data analysis stage. Data collection techniques in this study were observation, test, and interviews. Observation is used to know the implementation of learning through blended learning based on Indonesian Realistic Mathematics Education Approach (PMRI), test is used to determine students' mathematical literacy skills, and interviews is used to confirm the results of the tests that students had done. Based on the results of research representative with three student subjects, the component that most often appears is communication and using the language of symbol operations, formal and technical. Communication is seen when students writing statements about information from a problem and when students presenting the results obtained. Using the language of symbol operations, formal and technical, that is when students using formal forms based on mathematical definitions and rules.

Keywords: *Mathematical Literacy Skills, Blended Learning, Indonesian Realistic Mathematics Education Approach.*

1. INTRODUCTION

In the development of the 21st century, mathematics is a very important for students. There are five competencies in learning mathematics, namely problem solving, communication, reasoning, mathematical connections and mathematical representation [1]. In preparing the lesson plan for the 2013 revised 2017 curriculum, there must be four kinds of contents, namely Character Strengthening Education, school literacy, 21st century development and HOTS [2]. The skills in the description above refers to the skills of mathematical literacy, namely a person's skills to formulate, implement and conclude mathematics related to contextual problems [3,4]. In Indonesia, mathematical literacy skills are also an aspect of the Minimum Competency Assessment (AKM), one of the National Assessment instruments [5]. One of the material branches in mathematics learning for grade VII which is tested in AKM is algebraic form. Algebraic forms are related to coefficients, constants, variables and terms that can be used to solve problems in everyday life [6]. Algebraic material can be given to students in the form of HOTS problems to practice higher-order thinking skills and improve mathematical literacy skills [7].

However, in reality, students' mathematical literacy skills are currently still low. This can be seen from the results of PISA 2018, Indonesia is ranked 73 out of 78 countries and gets a mathematics score of 379 [8]. In addition, the TIMSS results also state that there are three causes of the low literacy skills student Fs, namely (1) weak curriculum, (2) many untrained teachers, and (3) lack of support from the surrounding environment and schools [9]. This is evidenced by the results of research conducted by Rifai & Wustqa [10], the low of mathematical literacy skill is also due to the difficulty student Fs in understanding, formulating, applying and reasoning mathematics. These difficulties are part of mathematical literacy skills.

The challenges of education today are even greater due to the Covid-19 pandemic. In line with government

regulations, the implementation of learning is carried out online from homes. This is expected to reduce student activities outside the home and is expected to suppress the spread of Covid-19 [11]. This online learning makes the students feel bored quickly and lack of concern for the literacy skills so that they had difficulty in following study [12]. Therefore, in order to seeking information and can continue to learn without any time limit and place, a combination of learning is needed [13]. One way that can be done is by providing a learning experience through blended learning [14]. The cause of the low mathematical literacy skills student Fs is also due to the mathematics teacher is not used to giving contextual problems [15]. Based on the results of interviews with junior high school mathematics teachers found that there are still many students have difficulty in understanding contextual problem and state a statement of the problem [16]. Not only that, students also experience confusion when formulate problems related to real life in the form of mathematical models [17]. In addition, there are also teachers who use conventional learning, where the lack of contribution students to be enthusiastic in learning guided by the teacher as a facilitator [18].

It is necessary to apply problems related to everyday life in order to help students understand contextual problems, use models, interactivity and contribute to learning and can help students practice mathematical literacy skills [19]. Therefore, one approach that is based on the context of everyday life is the PMRI approach which is adapted from the teaching and learning theory Realistic Mathematics Education (RME) in the Netherlands [20,21]. The PMRI approach is an approach to learning mathematics related to real life so that the learning process will be more meaningful [22].

There are several previous studies related of mathematical literacy skills and blended learning, as in the research conducted by Aritonang & Safitri [23] who investigated the effect of blended learning to increase mathematical literacy. In addition, there are also studies related to mathematical literacy and PMRI approach. As research conducted by Larasty, et al, [19]. However, researchers have not found combined research between mathematical literacy skills, blended learning and PMRI approach. This is considered important to note given that mathematical literacy skills can not only be activated by blended learning, but also uses an approach related to everyday life, namely PMRI. Based on the description above, researchers are interested in conducting research in depth with the title "Mathematical Literacy Skills of Junior High School Students Through Blended Learning Based on Indonesian Realistic Mathematics Education Approach".

2. METHOD

This study uses a descriptive type with a qualitative approach which aims to describe students' mathematical literacy skills through blended learning based on the Indonesian Realistic Mathematics Education approach. The subjects in this study were class VII.11 students of SMP Negeri 40 Palembang in the odd semester of the 2021/2022 academic year with a total of 35 students. Students' mathematical literacy skills can be seen from the problem results which amount to 2 items of description. The components and indicators of mathematical literacy skills are presented below:

Table 1. Components and indicators of mathematical literacy skills [8]

No.	Components	Indicator
1.	Communication	Write a statement about the information of a problem Summarize or present the result obtained
2.	Mathematization	Turning real-world problems into mathematical form
3.	Representation	Using a variety of representation in problem solving
4.	Reasoning and arguments	Provide justification for statements or problem solutions
5.	Choose a strategy to solve the problem	Develop a mathematical plan or strategy to solve a contextual problem
6.	Using language, symbol operations, formal and technical	Use formal forms based on mathematical definition and rules
7.	Using mathematical tools	Tools to find out how to use these tools in solving math problems

In this study, only six components are discussed, namely communication, mathematization, representation, reasoning and argumentation, choosing strategies to solve problems, and using language, symbol operations, and techniques. This is in line with previous research by Santoso and Setyaningsih [7] who also researched mathematical literacy skills in the material algebraic forms and not using components using mathematical tools.

The procedure for implementing this research consists of three stages, namely the preparation stage, the implementation stage and the data analysis stage. The preparation stage consists of several activities such as

conducting observations to schools, taking care of research permits, making research instruments and validating research instruments including student's worksheet based on PMRI approach. The implementation stage of learning activities using blended learning with the PMRI approach. In this study, online learning is carried out using the application zoom meetings and google classroom, while face-to-face learning is carried out in a limited manner. This research was conducted in three meetings, with the first meeting being given students' worksheet regarding the operation of multiplication of algebraic forms, the second meeting being given students' worksheet regarding the operation of dividing algebraic forms and the third meeting being a student's mathematical literacy problem regarding the operation material of algebraic forms.

The data collection techniques in this study consisted of observations, test and interviews. Observations were made to see the implementation of learning through blended learning based on the PMRI approach. The problem was conducted to measure students' mathematical literacy skills on algebraic material with the PMRI approach. Interviews were conducted to confirm the results of the problems that students had done. The data are analysed descriptively.

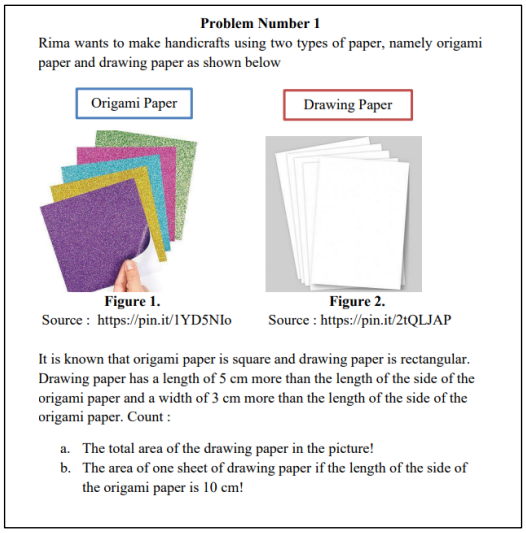
3. RESULTS AND DISCUSSION

This research was conducted in three meetings. The first two meeting were teaching and learning activities and the last meeting is test. Material for the first meeting was about multiplication operation of algebraic forms and division operation of algebraic forms was in the second meeting. Learning is started with pre-scheduled asynchronous learning, continued with synchronous learning, ended with post-scheduled asynchronous learning. In pre-scheduled asynchronous learning, students were given teaching materials and did discussions about the material for multiplication operations in algebraic forms in Google Classroom. In synchronous learning, students are given worksheet to solve problems in student's worksheet. Lastly, in post-scheduled asynchronous, students worked on their assignment and submitted it to Google Classroom. The characteristics of PMRI approach that appear in the learning process are using contextual problems, using models, students' contributions, interactivity, and intertwining with other topics

The activity at the third meeting was in the form of a problem that aims to see students' mathematical literacy skills. Students were given two problems in the form of descriptions, namely one question regarding the operation of multiplication of algebraic forms and another question concerning the operation of division of algebraic forms. The third meeting was conducted online through the Zoom Meetings application. The result of students' works was collected in Google Classroom.

3.1 Analysis of Student Answers to Problem Number 1

Based on the results students' answers to problem number 1, students with high level and medium level fulfill the five components of mathematical literacy Skills. Meanwhile, students with low level fulfills two components, namely the communication component and the component using language, symbol operations, formal and technical. The following is the problem number 1 for mathematical literacy skills:



Problem Number 1

Rima wants to make handicrafts using two types of paper, namely origami paper and drawing paper as shown below

Origami Paper

Drawing Paper

Figure 1.
Source : https://pin.it/1YD5NIo

Figure 2.
Source : https://pin.it/2tQLJAP

It is known that origami paper is square and drawing paper is rectangular. Drawing paper has a length of 5 cm more than the length of the side of the origami paper and a width of 3 cm more than the length of the side of the origami paper. Count :

a. The total area of the drawing paper in the picture!
b. The area of one sheet of drawing paper if the length of the side of the origami paper is 10 cm!

Figure 1 Mathematical literacy skills problem number 1 [24]

The student answers for number 1 can be seen in Figure 2.

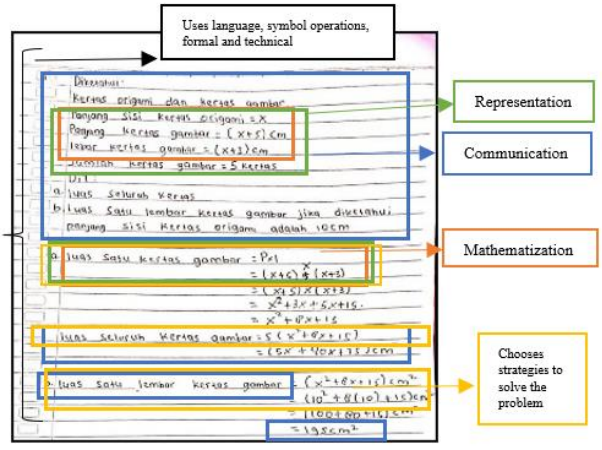


Figure 2. The answers of student GA for the problem number 1

Based on the problem results obtained, GA is categorized as a student with high level. In solving on problem number 1, GA fulfills five components of mathematical literacy skills. The first component, communication, GA can write statements about

information from a problem and present the results obtained. In the mathematization component, GA can also transform real-world problems into mathematical form. In the representation component, GA uses various representations in solving problem number 1. In the reasoning and argument component, GA does not provide justification for statements or solutions to problem number 1. In the component choosing strategies to solve problems, GA can plan and mathematical strategies for solving contextual problems. In the last component, using language, symbol operations, formal and technical, GA can use formal forms based on mathematical definitions and rules.

According to GA's explanation from the interview results, GA has understood the information contained in the problem well, where he can explain what is known from the problem, namely the length of the side of the origami paper for example by x, the length of the drawing paper $(x+5)cm$, the width of the drawing paper $(x+3)cm$ and the number of there are 5 sheets of drawing paper in the picture. The problem asked the area of the entire drawing paper and the area of one drawing paper if the length of the side is 10 cm.

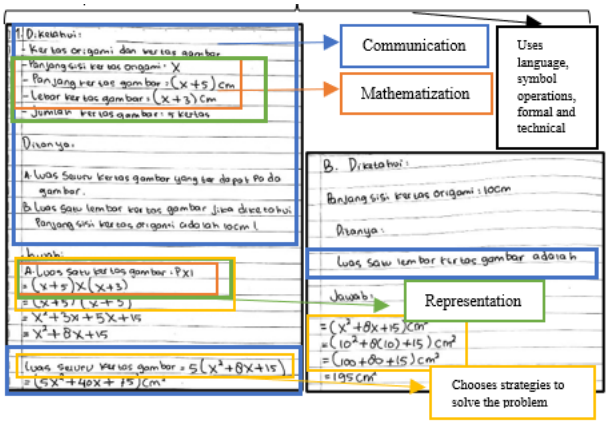


Figure 3 The Answers of student CA for the problem number 1

Based on the problem results obtained, CA is categorized as a student with medium level. In solving on problem number 1, CA fulfills five components of mathematical literacy skills. The first component, namely communication CA can write statements about information from a problem and present the results obtained. In the mathematization component, CA can also transform real-world problems into mathematical form. In the representation component, CA uses various representations in solving problem number 1. In the reasoning and argument component, CA does not provide justification for statements or solutions to problem number 1. In the component choosing strategies to solve problems, CA can plan and mathematical strategies for solving contextual problems. In the last component, namely using language, symbol operations, formal and technical, CA can use formal forms based on mathematical definitions and rules.

According to CA's explanation from the interview results, CA has understood the information contained in the problem well, where he can explain what is known from the problem, namely the length of the side of the origami paper for example by x, the length of the drawing paper $(x+5)cm$, the width of the drawing paper $(x+3)cm$ and the number of there are 5 sheets of drawing paper in the picture. Then for the problem asked, namely the area of the entire drawing paper and the area of one drawing paper if the length of the side is 10 cm. CA also writes mathematical symbols but does not write down the statements obtained.

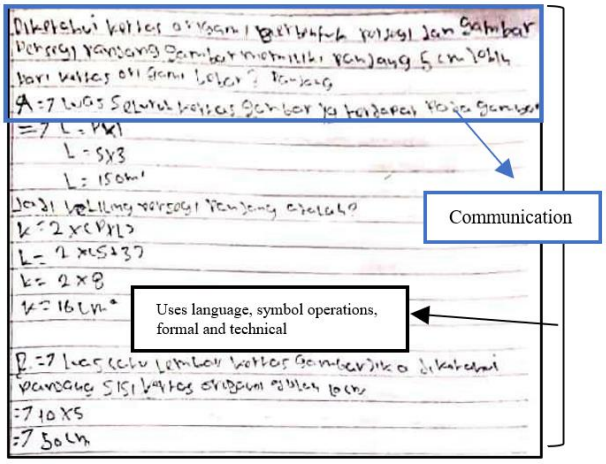


Figure 4 The answer of student F for the problem number 1

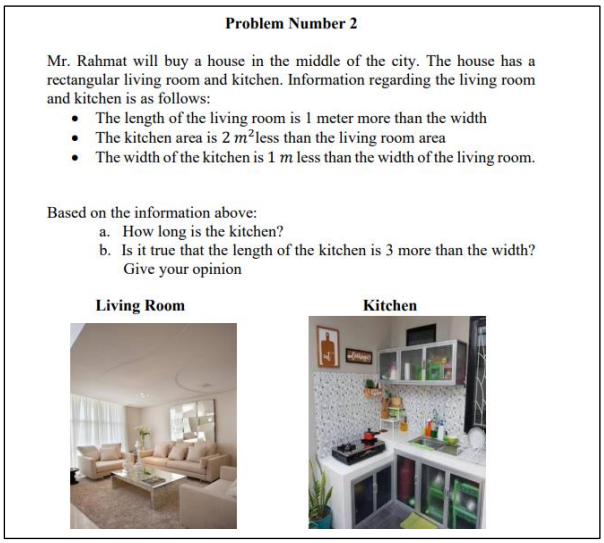
Based on the problem results obtained, F is categorized as a student with low level. In solving on problem number 1, F fulfills two components of mathematical literacy skills, namely the communication component and the component using language, symbol operations, formal and technical. The first component, namely communication F can write statements about information from a problem and present the results obtained. In the mathematization component, F has not been able to convert real-world problems in mathematical form. In the representation component, F has difficulty using various representations in solving problem number 1. In the reasoning and argument component, F has difficulty in providing justification for the statement or solution of problem number 1. In the component choosing a strategy to solve the problem, F still looks confused in formulating mathematical plans and strategies to solve contextual problems. In the last component, namely using language, symbol operations, formal and technical, F can use formal forms based on mathematical definitions and rules.

According to F's explanation from the interview results, F actually understood the information contained in the problem, as written on the test results. However, F forgot the size of the width and the problem asked for part b, where he could explain what he knew from the question, that is the length 5 cm drawing paper is more

than origami paper. The results of this interview show that F has understood the problem. In addition, it can be seen that F has difficulty in converting the problem into mathematical form. As written in the problem information, for the sentence "drawing paper has a length of 5 cm more than the length of the side of the origami paper", F cannot yet write that the length of the drawing paper is. F immediately wrote that the length of the drawing paper was 5 cm. Furthermore, F is also difficult to represent, make reasoning and use strategies.

3.2. Analysis of Student Answers to Problem Number 2

Based on the results students' answers to problem number 2, high level students fulfill all components of mathematical literacy skills. Meanwhile, the students with medium and low level fulfill three components, namely the communication component, the reasoning and argument component and the component using language, symbol operations, formal and technical. The following figure is the problem number 2 for mathematical literacy skills.



Problem Number 2

Mr. Rahmat will buy a house in the middle of the city. The house has a rectangular living room and kitchen. Information regarding the living room and kitchen is as follows:

- The length of the living room is 1 meter more than the width
- The kitchen area is 2 m^2less than the living room area
- The width of the kitchen is 1 m less than the width of the living room.

Based on the information above:

a. How long is the kitchen?
b. Is it true that the length of the kitchen is 3 more than the width? Give your opinion

Living Room **Kitchen**

Figure 5 Mathematical literacy skills problem number 2 [24]

The student answers number 2 can be seen in Figure 6.

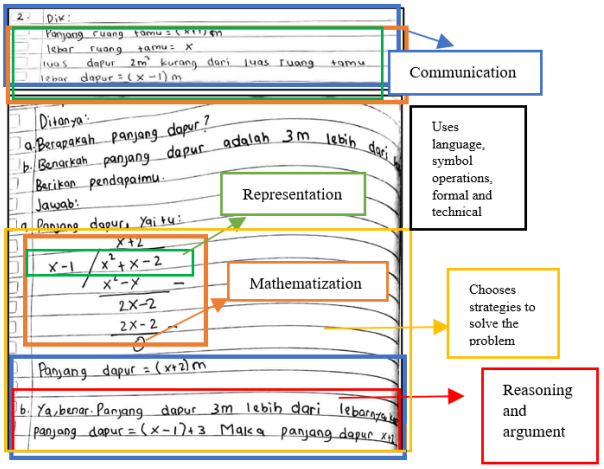


Figure 6 The answer of student GA for the problem number 2

In solving on problem number 2, GA fulfills all components of mathematical literacy skills. The first component, namely communication GA can write statements about information from a problem and present the results obtained. In the mathematization component, GA can also transform real-world problems into mathematical form. In the representation component, GA uses various representations in solving problem number 2. In the reasoning and argument component, GA can also provide justification for statements or solutions to problem number 2. In the component choosing strategies to solve problems, GA can plan and mathematical strategies for solving contextual problems. In the last component, namely using language, symbol operations, formal and technical, GA can use formal forms based on mathematical definitions and rules.

According to GA's explanation from the interview results, GA has understood the information contained in the problem, where he can explain what is known from the problem. GA represents the width of the living room as x, the length of the living room as (x+1) m, the width of the kitchen as (x-1) m, and the area of the kitchen is $2m^2$ less than the area of the living room. The problem asked what the length of the kitchen for part a is and it is true that the length of the kitchen is 3 more than the width. In addition, GA can also present the results obtained. GA can also use descending division.

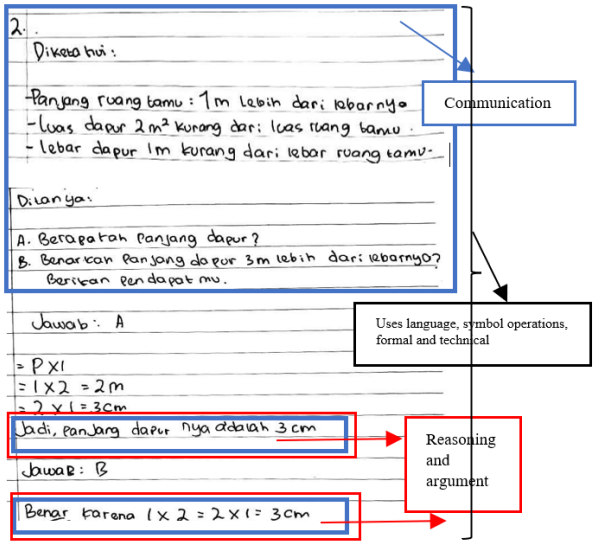


Figure 7 The answer of student CA for the problem number 2

In solving on problem number 2, CA fulfills three components of mathematical literacy skills, namely communication components, reasoning and argument components as well as components using language, symbol operations, formal and technical. The first component, namely communication, CA can write statements about information from a problem and present the results obtained. In the mathematization component, CA has not been able to convert real-world problems into mathematical form. In the representation component, CA has difficulty using various representations in solving problem number 2. In the reasoning and argument component, CA can provide justification for the statement, but the reasons given are not correct. In the component of choosing strategies to solve problems, CA still looks confused in formulating mathematical plans and strategies to solve contextual problems. In the last component, namely using language, symbol operations, formal and technical, CA can use formal forms based on mathematical definitions and rules.

According to CA's explanation from the interview, CA has written down the information contained in the problem, where he can explain what is known from the question. He knew that the length of the living room is 1 meter more than its width, the kitchen area is less than the living room area and the kitchen width is less than the living room width. The problem being asked, what the length of the kitchen for part a is and is it true that the length of the kitchen is 3 more than the width. In addition, CA can also present the results obtained. However, CA has difficulty in converting the problem into mathematical form. As written in the question information, for the sentence "the length of the living room is 1 m more than the width", CA has not been able to write that the length of the living room is 1m and is multiplied by the size of the kitchen area. In addition, CA also has difficulty in representing and using strategies. However, CA can use reasoning and use language, symbols, formal and technical.

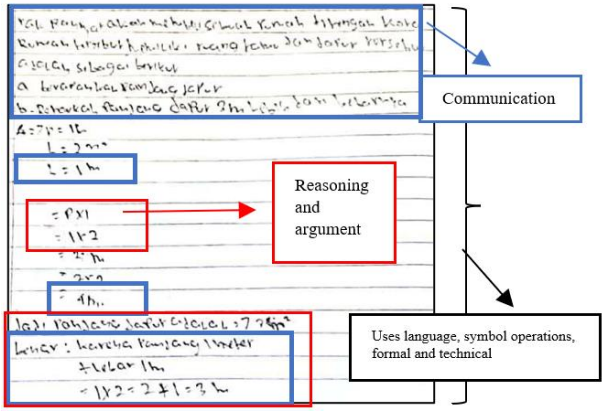


Figure 8 The answer of student F for the problem number 2

In solving on problem question number 2, F fulfills three components of mathematical literacy skills, namely communication components, reasoning and argument components as well as components using language, symbol operations, formal and technical. The first component, namely communication, F can write statements about information from a problem and present the results obtained. In the mathematization component, F has not been able to convert real-world problems into mathematical form. In the representation component, F has difficulty using various representations in solving problem number 2. In the reasoning and argument component, F can provide justification for the statement, but the reasons given are not correct. In the component of choosing strategies to solve problems, F still looks confused in formulating mathematical plans and strategies to solve contextual problems. In the last component, namely using language, symbol operations, formal and technical, F can use formal forms based on mathematical definitions and rules.

According to F's explanation from the interview, F has written down the information contained in the problem, where he can explain what is known from the question. The length of the living room is 1 meter more than its width, the kitchen area is less than the living room area and the kitchen width is less than the living room width. In addition, F can present the results obtained. However, F has difficulty in converting the problem into mathematical form. As written in the question information, for the sentence "the length of the living room is 1 m more than the width", F has not been able to write that the length of the living room is 1m and is multiplied by the size of the kitchen area. In addition, F also has difficulty in representing and using strategies. However, F can use reasoning and use language, symbols, formal and technical.

Table 2. The appearance of mathematical literacy skills components

Subject	Number	Components of Mathematical Literacy Skills					
		1	2	3	4	5	6
GA	1	✓	✓	✓	–	✓	✓
	2	✓	✓	✓	✓	✓	✓
CA	1	✓	✓	✓	–	✓	✓
	2	✓	–	–	✓	–	✓
F	1	✓	–	–	–	–	✓
	2	✓	–	–	✓	–	✓

Description:
1: Communication component
2: Mathematization component
3: Representation component
4: Reasoning and argument component
5: Chooses strategies to solve the problem component
6: Uses language, symbol operations, formal and technical component
✓: Component appears
- : Component does not appear

Based on the result of observations during two meetings, the implementation of the learning carried out was quite good with the emergence of the characteristics of blended learning and the PMRI approach. The characteristics of blended learning that emerge, for example, are two modes of learning and students' new experiences in using technology, the diverse roles of teachers and so on.

Based on the results of the analysis of test data, interviews and observations, from the six components of mathematical literacy skills, high level student fulfills five components in test number 1 and all components in number 2. Student with medium level fulfils five components on test number 1 and three components on number 2. Student with low level fulfils two components in test number 1 and three components in number 2. There are two components which most often appear in this study, namely the communication component and using language of symbolic operations, formal and technical component. This is in accordance with previous research which states that communication is the basic component that most students have in mathematical literacy skills [7]. In addition, student with high level fulfill the communication component and student with low level have not been able to turn the problem into a mathematics [19]. This is in line with other studies which states that students with high and medium level, on the aspects of recognize the problem, two subjects can mention which known and asked questions clearly and precisely [25]. In addition, there are also studies which state of mathematical literacy skills that always appears is the ability to use language, symbol operations, formal and technical component [26].

4. CONCLUSION

Based on the results of research at SMP Negeri 40 Palembang with three subjects with high, medium and low levels, the conclusions are: of the six components of mathematical literacy skills, the component that most often appears is the communication component, that is when students writing statements about information from a problem and when students present the results obtained and components using the language of symbol operations, formal and technical, that is when students using formal forms based on mathematical definitions and rules. While the components that rarely appear are the mathematization component, that is when students turning real-world problems into mathematical form, the representation component when students using various representations in solving problems, reasoning and argument and component choosing strategies to solve problems when students making plans and mathematical strategies to solve contextual problems.

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