Mathematical Literacy Ability of Junior High School Students in Terms of Self-Efficacy

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ABSTRACT

Mathematical literacy is an individual's ability to formulate, employ, and interpret mathematics in various contexts. One of the factors that influence this ability is self-efficacy. This study aims to obtain an overview of the mathematical literacy ability of junior high school students in terms of self-efficacy. The research method used is qualitative research with a phenomenological approach. The instruments used were researchers as the research implementer, a selfefficacy scale, a mathematical literacy ability test and interview guideline. The subjects of this study were three students who had filled out the self-efficacy scale, consisting of one student with a high level of self-efficacy, one student with a moderate level of self-efficacy and one student with a low level of self-efficacy. The results show that student with a high level of self-efficacy can meet three indicators of mathematical literacy ability and use the knowledge gained from their experience in solving problems, student with a moderate level of selfefficacy can meet two indicators of mathematical literacy ability and tend to try to solve the given problem, meanwhile student with a low level of self-efficacy only meet one indicator of mathematical literacy ability and less aware of the role of mathematics in everyday life.

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INTRODUCTION

Mathematics is a basic knowledge that is learned at every level of education. This shows that mathematics is an important field of study. Mathematics learning is often seen as abstract learning with stratified concepts and principles (Karlina Rachmawati et al., 2021). Mathematics lesson aims to prepare students to be able to use mathematical thinking in everyday life (MZ, 2013). Because in mathematics, students are not only required to count but also logical and critical reasoning skills in solving problems (Sari, 2015). Therefore, students must be able to master mathematics so that their potential can develop (Widyaswara & Pertiwi, 2018).

Mathematical literacy is an individual's capacity to reason and to formulate, employ, and interpret mathematics to solve problems in a variety of real-world contexts. It includes concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals to know the role that mathematics plays in the world and to make the well-

founded judgments and decisions needed by 21st citizens (OECD, 2018). There are three indicators of mathematical literacy: (1) formulate mathematical situations and provide a mathematical form of the problem presented in contextual form; (2) apply mathematical concepts, facts, procedures and reasoning in solving problems formulated mathematically; and (3) interpret the mathematical solutions, results, and conclusions into the context of real-life problems.

Everyone with all their unique intelligence must have mathematical literacy ability and adequate mathematical connections (Masjaya & Wardono, 2018). Related to this statement, students must have a good mathematical literacy ability because it can help them to understand the role of mathematics in every aspect of life and use it to solve problems in everyday life (Istiqomah, 2019). Besides that, it is important to have mathematical literacy ability so that the materials obtained by students can be interpreted in everyday life (Ahmad & Nasution, 2019; Ginanjar & Widayanti, 2018; Janah et al., 2019). If students' mathematical literacy ability is low, they will have difficulty when understanding and solving mathematical problems (Sulistio et al., 2020). Therefore, students need to have a good mathematical literacy ability so that it is easy for them to solve mathematical problems in everyday life.

Unfortunately, the reality of students' mathematical literacy ability in Indonesia is still far from expectations. This is shown by the results of PISA 2018, Indonesia is among the 10 countries with the lowest mathematical literacy ability, which is 73rd out of 79 countries that joined the PISA survey (Tohir, 2019). Indonesia's students scored lower than the OECD average in mathematics (OECD, 2019). Indonesia's students' average score for mathematical literacy is 379 out of an OECD average score of 487 (PISA Governing Board Indonesia, 2019). This is not better than the 2015 PISA results where the average score for Indonesia's students' mathematical literacy ability is 386 (OECD, 2016). It is known that students have difficulty in identifying information and converting it into simple mathematical forms (Wardani et al., 2022). The low mathematical literacy ability of students is influenced by several factors.

The factors that influence students' mathematical literacy ability include personal factors, instructional factors, and environmental factors (Mahdiansyah & Rahmawati, 2014). Self-efficacy is one of the personal factors that has an important role in achievement motivation (Somakim et al., 2019). Furthermore, self-efficacy can be interpreted as a person's assessment of his abilities in carrying out a series of behaviors to get the results he wants to achieve (Bandura, 1997). Regarding this, self-efficacy is students' belief in their ability to complete tasks that is related to solving mathematical problems correctly (Prabawanto, 2013). In addition, according to Subaidi (in Umbara & Sudihartinih, 2020), the level of self-efficacy affects students' confidence in solving mathematical problems. This means that in mathematical literacy ability, students need to have self-efficacy due to it takes confidence and persistence of students. Therefore, researchers are interested in conducting research to get an overview of the mathematical literacy ability of junior high school students in terms of self-efficacy.

METHOD

This research is qualitative research using a phenomenological approach. A phenomenological approach is a research strategy in which the researcher identifies the nature of human experience regarding a particular phenomenon. This method was chosen because the focus of this study is the mathematical literacy ability of junior high school students in terms of self-efficacy.

This research was conducted on eight grade students in one junior high school in Bandung Raya, West Java. The subjects of this study were students who had filled out the self-efficacy scale and were grouped into self-efficacy levels as shown in Table 1. The subjects in this study were three students consisting of one student with a high level of selfefficacy, one student with a moderate level of self-efficacy and one student with a low level of self-efficacy. Subjects were chosen randomly to describe the actual conditions.

Table 1. Student Self-Efficacy Level Measurement Scale	
Interval	Student's Level of
	Self-Efficacy
$X \ge (\bar{x} + 0,5SD)$	High
$(\bar{x} + 0.5SD) > X > (\bar{x} - 0.5SD)$	Moderate
$(\bar{x} - 0,5SD) \ge X$	Low

Notes:

X = student's self-efficacy score

 \bar{x} = average of students' self-efficacy score

SD = standard deviation of students' self-efficacy score

The instruments used in this study were the researchers as the planner, the data collector and analyzer, and the research results reporter, self-efficacy scale, mathematical literacy ability test (with the linear equation in two variables topic) and interview guideline. Each question in the mathematical literacy ability test is based on the OECD mathematical literacy indicators as in Table 2. The interview guideline was used when interviewing the subjects. The interview in this research is a semi-conducted interview to get further information that can't be known from the student's answer sheet.

	Table 2. Mathemat	ical Literacy Test Instrument
Number	Indicator	Problem
1	Formulate mathematical situations and provide a mathematical form of the problem presented in contextual form	Mr. Budi is a rice seller. Today he sells two types of rice in his shop as much as 45 kg. the price of 1 kg of Pandan Wangi rice is Rp13.000,00 and the price of 1 kg of Rojo Lele rice is Rp11.000,00. Mr. Budi's income today is Rp525.000,00. Determine the mathematical equation needed if Mr. Budi wants to know the amount of each type of rice sold!
2	Apply mathematical concepts, facts, procedures and reasoning in solving problems formulated mathematically	Today there will be a theatrical performance with a duration of 1 hour at the Rumentang Siang Building. This building can accommodate up to 347 audience. During the current Covid-19 pandemic, the Rumentang Siang Building can only accommodate 85 audience. All tickets for this theater show were sold out. Tickets consist of economy class and VIP. The price for each economy class ticket is Rp.

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		15,000.00 while the VIP class is Rp. 25,000.00. Revenue from ticket sales is Rp. 1,475.000,00. How many tickets were sold for each class?
		Adit is Aksa's older brother, Adit is 4 years older than Aksa. Five years from now, the sum of their ages will be 28. How old are each of them now? If the problem is solved by the graphical method, the solution is obtained as follows.
3	Interpret the mathematical solutions, results, conclusions into the context of real-life problems	y x + y 15 -5 -5 x - y = 4
		What does (11,7) on the graph mean? Give your reasons!

Data analysis was carried out from the beginning of data collection so that if there was a shortage of data, it could be completed immediately. In this study, there are three stages of data analysis, namely: (1) data reduction includes activities to summarize, select the main things and delete things that are not needed; (2) data presentation that aims to find the meaning of the words conveyed by the subject and then arranged systematically so that it is easy to understand; and (3) conclusion that aims to answer the research question.

RESULTS AND DISCUSSION

Mathematical literacy ability test and interview were conducted by the three subjects. Furthermore, all subjects are given a code to facilitate the discussion. The S1 code is for the student with a high level of self-efficacy, the S2 code is for the student with a moderate level of self-efficacy and the S3 code is for the student with a low level of self-efficacy.



Figure 1. S1's answer to question number 1

Based on Figure 1, we can see that S1's answer to question number 1 is correct. We can see that S1 not only provides the equations that question number 1 asks for, but S1 also provides the solution to the given problem. It means that S1 can understand the given problem well. S1 can formulate mathematical situations and provide a mathematical form of the problem presented in contextual form. Referring to the results of the interview, it is known that S1 can solve the problem because she has knowledge and experience that has been gained previously in the class. This is in line with a research conducted by Purwanti and Mujiasih (2021) which states that students with a high level of self-efficacy can convert real problems into mathematical form.

*	2 jenis beras = as leg
	Pandan Wangi = X
	pojo lele = y
	Pendapatan = 525.000
	persamaan maternatis
	13.000x * 11.000 y = 525.000
terre terret	

Figure 2. S2's answer to question number 1

Based on Figure 2, we can see that S2's answer to question number 1 is not complete. S2 only gives one equation, whereas it should be two. Therefore, an interview was conducted to get further information. Referring the results of the interview, it is known that S2 is still confused in making the mathematical structure of mathematical problem presented in contextual form. According to Jupri and Drijvers (2016), the main difficulty of students is formulating mathematical models.

1) x + y = 4s	* * **
13000 × + 11000 y = 525.000	

Figure 3. S3's answer to question number 1

Based on Figure 3, we can see that S3's answer to question number 1 is correct. However, it is not stated what is the meaning of variables x and y. Therefore, an interview was conducted to get further information. When interviewed, S3 can convey the meaning of the variables x and y. This means similar to S1, S3 can formulate mathematical situations and provide a mathematical form of the problem presented in contextual form. This is in line with a research conducted by Amelina (2020) which concludes that students with a low level of self-efficacy are quite capable to formulate solutions to a problem.

2) Ekonomi = X		
VIP = y		
x + y = 85		
15.000 × + 25.000 y =1.975.000 ×1		
Menjerdi	15.000 × +15.000 + 1.275.000	
15.000x+25.000y=1.975.000	15.000 × + 15.000.10= 1375.000	
15 000 x + 15.000y = 1 270.000	15.000 × = 1.275.000 - 3	300.00
10, 000 11	15.000 × = 975.000	
200,000	x = 975.000	
9 = 100-000	15.000	
y = 20	× = 65	
Jadi tiket VIP terjual sebanyak 20 tiket	Jadi fiket ekonomi terjual rilanyat bi	-diket

Figure 4. S1's answer to question number 2

Mathematical Literacy Ability of Junior High School Students in Terms of Self-Efficacy (Mutiara Pertiwi, Suhendra, Dadang Juandi) We can see in Figure 4, that S1's answer to question number 2 is correct. It means that S1 can apply mathematical concepts, facts, procedures and reasoning in solving problems formulated mathematically. Based on the results of the interview, it is known that S1 can answer the question because she remembers the material that has been given in the class. This is in line with a research conducted by Parastuti et al. (2019) which argues that students with a high level of self-efficacy can apply mathematical concepts, facts, and procedures in solving PISA mathematical problems.

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Ĵ.	a+20 -80 -10
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2	a: 60
2	the state of the second
0	Farcis up terjual : relas economi las rarcis
	" UTP : 20 Torres

Figure 5. S2's answer to question number 2

As we can see in Figure 5, S2's answer to question number 2 is correct. It means that S2 can apply mathematical concepts, facts, procedures and reasoning in solving problems formulated mathematically. Even though she has not been able to make a mathematical structure for the problem in question number 1, in this problem, S2 can provide a mathematical structure of the problem presented contextually. A similar idea was stated by Nugroho (2019), he states that students with a moderate level of self-efficacy can reason and provide the reason in solving problems.

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	22000 <82-9) + 12000 A = 1.432.000
3	25000 000 - 25000 + 15000 y = 1.475.000
-	25000 × T 15000 y = 1.475.000 - 25000 000
	- 40000 = - 23, 525.000
	Y = 588
	x = 85 - Y
	: 867 - 788
	: 503

Figure 6. S3's answer to question number 2

As we can see in Figure 6, S3 has not been able to provide the solution to the problem given in question number 2. The procedure that S3 used is not clear. Therefore, an interview was conducted to get further information. Based on the results of the interview, it is known that S3 does not understand how to solve the given problem. It is also known that S3 is less aware of the role of mathematics in everyday life. This is in line with the statement stated by Askar et al. (2016) that students with a low level of self-efficacy have not been able to solve a problem.

D 177

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3) yang diniakrud 11,7 udalah umur Akrudan umur adit. Karena titik potong puda rekuab motode
grafik adalah haril duri permaralahan teb.
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Figure 7. S1's answer to question number 3

Based on Figure 7, we can see that S1's answer to question number 3 is correct and the reason for the answer is stated. To find out more information, an interview was conducted. Referring to the results of the interview, it is known that S1 can answer the question because she has knowledge and experience that has been gained previously in the class. She can also prove the answer by substituting the value of x and y into the equation so that it becomes a closed sentence with a true value. It means that S1 can interpret the mathematical solutions, results and conclusions into the context of real-life problems. This is in line with a research conducted by Askar et al. (2016) which concludes that students with a high level of self-efficacy can connect problems with knowledge and experience while studying and evaluating work results.



Figure 8. S2's answer to question number 3

Based on Figure 8, we can see that S2's answer to question number 3 is not correct. S2 performs calculations that are not required by the question. It means that S2 is not able to interpret the mathematical solutions, results and conclusions into the context of real-life problems. This is contrary to the statement argued by Ghofur (2020) that students with a moderate level of self-efficacy have a quite good mathematical literacy ability.



Figure 9. S3's answer to question number 3

Furthermore, in Figure 9, we can see that S3's answer to question number 3 is not correct. Similar to S2, S3 performs calculations that are not required by the question. Therefore, an interview was conducted to get further information. Referring to the results of the interview, it is known that S3 has not been able to understand a mathematical solution presented in graphical form. It means that S3 is not able to interpret the mathematical solutions, results, and conclusions into the context of real-life problems. This is in line with the statement stated by Thien and Darmawan (in Muhazir et al., 2020) and Papanastasiou (2000) that self-efficacy is the variable that is most correlated with students' mathematical achievement.

Based on the analysis of each indicator of mathematical literacy ability, it can be seen that students with different levels of self-efficacy have different mathematical literacy abilities for each indicator. This is indicated by students with different levels of self-efficacy having different understandings and solutions to the given problems, where student with a high level of self-efficacy use their knowledge and experience in solving problems, student with a moderate level of self-efficacy moderate efficacy tend to keep trying to solve problems, while student with low self-efficacy level are less aware of the role of mathematics in everyday life.

CONCLUSION

Based on the results and discussions that have been presented, it can be concluded that student with a high level of self-efficacy can meet three indicators of mathematical literacy ability and use the knowledge gained from their experience in solving problems, student with a moderate level of self-efficacy only meet two indicators of mathematical literacy ability and tend to try to solve the problems given, besides that, student with a low level of selfefficacy only meet one indicator of mathematical literacy ability and are less aware of the role of mathematics in everyday life.

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Kemampuan Literasi Matematis Siswa Sekolah Menengah Pertama Ditinjau dari Self-Efficacy

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Abstrak

Literasi matematika adalah kemampuan individu untuk merumuskan, menggunakan, dan menginterpretasikan matematika dalam berbagai konteks. Salah satu faktor yang mempengaruhi kemampuan tersebut adalah *self-efficacy*. Penelitian ini bertujuan untuk memperoleh gambaran tentang kemampuan literasi matematika siswa SMP ditinjau dari *self-efficacy*. Metode penelitian yang digunakan adalah penelitian kualitatif dengan pendekatan fenomenologi. Instrumen yang digunakan adalah peneliti sebagai pelaksana penelitian, skala *self-efficacy*, tes kemampuan literasi matematika, dan pedoman wawancara. Subjek penelitian ini adalah tiga siswa yang telah mengisi skala *self-efficacy*, terdiri dari satu siswa dengan *self-efficacy* tinggi, satu siswa dengan *self-efficacy* sedang, dan satu siswa dengan *self-efficacy* rendah. Hasil penelitian menunjukkan bahwa siswa dengan *self-efficacy* tinggi dapat memenuhi tiga indikator kemampuan literasi matematika dan menggunakan pengetahuan yang diperoleh dari pengalamannya dalam memecahkan masalah, siswa dengan *self-efficacy* sedang dapat memenuhi dua indikator kemampuan literasi matematika dan cenderung berusaha memecahkan masalah yang diberikan, sedangkan siswa dengan *self-efficacy* rendah hanya memenuhi salah satu indikator kemampuan literasi matematika dan kurang menyadari peran matematika dalam kehidupan sehari-hari.

Keywords: Matematika, Literasi Matematis, Self-Efficacy

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