Analysis of students' mathematical literacy on online learning in terms of *self-efficacy*

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ABSTRACT

The purpose of this research is to analyze how students' mathematical literacy skills in online learning are viewed from self-efficacy. The method used in this research is a qualitative method with an analytical descriptive design. Data was collected using a self-efficacy questionnaire consisting of positive and negative statements and a mathematical literacy test. Data analysis was carried out by classifying students' self-efficacy into high, medium, and low categories by selecting 2 students for each category with the help of Microsoft Excel. Based on these data, it was found that students who had high self-efficacy were able to answer mathematical literacy questions on the indicators of formulating, using, and interpreting, but not completely and systematically. Students with medium self-efficacy are only able to complete level 1 mathematical literacy on indicators to formulate accurately, completely, and systematically. Students who have low self-efficacy are not able to solve mathematical literacy problems completely and systematically.

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INTRODUCTION

Online learning during the current pandemic is an unavoidable activity. Therefore, to support online learning so that it can run successfully, it takes confidence in the abilities that exist in students (Self-efficacy). Self-efficacy is needed from students to know that they have the ability to master the situation in following the learning process and can achieve positive results (Sariningsih & Purwasih, 2017).

Because the degree of students' confidence in their abilities will be related to the high and low achievements they will get (Riskiningtyas & Wangid, 2019). Efficacy is a perception of how well he can function in certain situations (Sovia et al., 2020). Self-efficacy is related to belief in his ability to be able to take the expected action. The perceptions built by these students will help them to be able to organize and carry out actions or assessments in carrying out a task for a purpose and produce something (Ratnaningsih, 2017).

In other words, self-efficacy is a person's perception of his ability to regulate the actions taken and carried out

to achieve his goals. The goal in question is an achievement in learning of course. Students with high self-efficacy abilities are able to complete the tasks given by the educator and are able to solve the problems they face.

However, based on observations made by the author, there are still many students who have difficulty in solving the given mathematical problems. Moreover, the problem or problem is in the form of a story and is related to the problems of everyday life. Mathematics is a discipline that studies abstract systems that are formed based on abstract elements and these elements cannot be described in a concrete plot or pattern (Annurwanda & Friantini, 2019). Because of its abstractness, mathematics is considered a difficult subject.

This difficulty makes students feel reluctant to take mathematics lessons either in person or face-to-face or online (in a network). Individual inability in the process of solving mathematical problems will have an impact on the development of fundamental mathematical abilities that must be possessed by individuals.

Mathematical literacy has a very important role in mathematics because students' mathematical literacy skills will have an impact on their ability to solve mathematical problems encountered. Where these abilities will also have a very important role in real life. Therefore, to continue to develop mathematical literacy skills, more attention is needed from educators to be able to train students by providing story questions related to everyday life. Because mathematical literacy emphasizes the ability of students to be able to analyze, give reasons for the answers given by linking the concepts, formulas, and mathematical knowledge they have to be able to solve the problems given effectively.

The decline in mathematical literacy skills is caused by the disruption in the development of students' fundamental

mathematical abilities (Oktaviyanthi & Agus, 2019). In other words, the inability of students to understand and solve mathematical problems related to everyday life shows the low mathematical literacy ability of students.

Based on the results of PISA (OECD, 2012, 2016, 2019b) shows Indonesia's ranking in PISA mathematical literacy results in 2012 was ranked 60th out of 65 participants with an average score of 371, in 2015 Indonesia was ranked 62th out of 70 participants with an average score of 386 out of 490, and in 2018 Indonesia was ranked 70th out of 78 participants with an average score of 379 out of 489.

Based on these results, it shows that the mathematical literacy of Indonesian students is still relatively low. The difficulties experienced by Indonesian students are in the process of formulating problems in everyday life into mathematical models (Sari & Manoy, 2018). Based on observations made by researchers, students' difficulties in solving problems related to daily life or in the form of story questions during online learning are caused by a lack of confidence in their abilities (Self-efficacy).

This is reinforced by Jatisunda (2017) who states that there is a link between problem-solving and student self-efficacy, where self-efficacy has a function as a tool to assess the success of students in solving problem-solving problems. In addition, based on the results of research conducted by Badjeber (2020) it was found that as many as 75% of students did not have confidence in their abilities (Self-efficacy).

In the research of Badjeber (2020), he did not break down the students' self-efficacy in the high, medium, and low categories. Therefore, in this research, researchers categorize students based on their self-efficacy categories. Thus, it can determine students' self-efficacy and can provide a clearer picture of how the mathematical literacy abilities of students

who have high, medium, and low self-efficacy.

The purpose of this research is to determine and analyze the mathematical literacy skills of students on online learning in terms of self-efficacy.

METHOD

The method used in this research is a qualitative method with an analytical descriptive design, with the aim of describing students' mathematical literacy skills in online learning in terms of self-efficacy. The flow chart of the method used is presented in Figure 1.
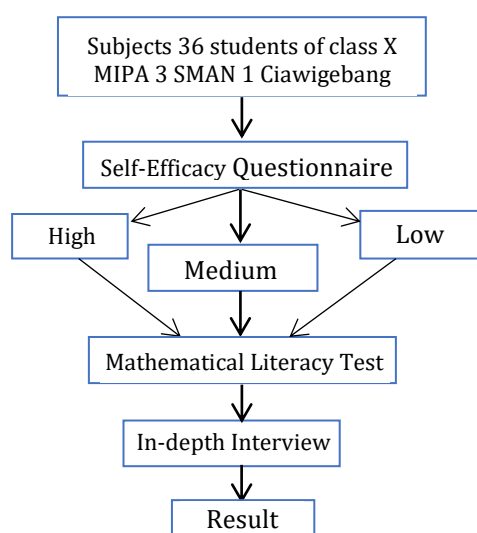
Figure 1. Flow chart of Research Method

Figure 1 shows a flowchart of the research method used. The subjects in this research were students of class X MIPA 3 SMA Negeri 1 Ciawigebang, totaling 36 students who were then selected into 6 students based on self-efficacy in the high, medium, and low categories.

The supporting instruments used were self-efficacy questionnaire sheets assisted by Google Forms, mathematical literacy questions, and in-depth interviews. The self-efficacy questionnaire was adapted (Croy et al., 2020) which includes magnitude, generality, and strength. Before the self-efficacy questionnaire was given to the research subject, it was first validated by a competent validator and had been declared valid. so that the self-efficacy questionnaire can be used to measure students' self-efficacy. The number of self-efficacy questionnaire statements was 15 positive and negative statements, respectively. Another supporting instrument is a mathematical literacy test adapted from PISA (OECD, 2019a) with indicators for formulating, employing, and interpreting.

The procedure in this research is to distribute the Google link for the self-efficacy questionnaire form through the WhatsApp group first which is then analyzed and selected based on self-efficacy in the high, medium, and low categories with 2 students selected for each category. So, the number of subjects in this research was 6 informants.

Data collection techniques using observation (nonparticipant observation), distributing self-efficacy questionnaires, mathematical literacy tests in the form of description questions, and in-depth interviews. Because the method used in this research is a qualitative method with an analytical descriptive design, the data analysis technique used triangulation of sources obtained from the results of distributing self-efficacy questionnaires, mathematical literacy tests, and in-depth interviews with the stages of scoring, data reduction, data presentation, and drawing conclusions.

RESULTS AND DISCUSSION

The research instrument used in this research has been validated by two validators and is declared valid. So that the number of self-efficacy questionnaire statements is 30 items consisting of positive (favorable) and negative (unfavorable) statements. Before analyzing the collected data, a normality test was first carried out, namely to find out and analyze whether the data that the researchers distributed came from data that were normally distributed or not. So that it can decide what test should be used

in further data analysis. The normality test was carried out using IBM SPSS Statistics, while the results of the normality test using the One-Sample Kolmogorov-Smirnov test that the data distributed came from data that were normally distributed. Thus, further analysis of the self-efficacy questionnaire data was carried out. The results of the recapitulation of the distribution of self-efficacy questionnaire data are presented in Figure 2.
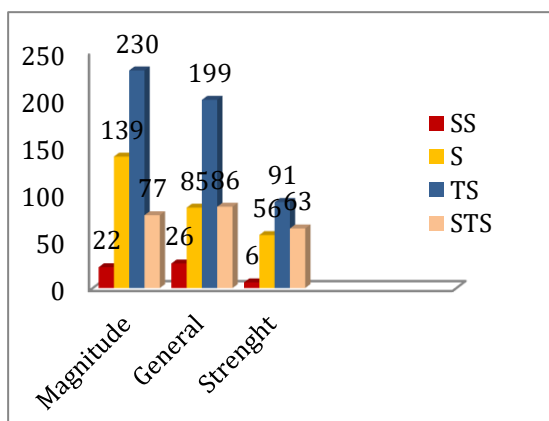
**Figure 2.** Recapitulation of Self-Efficacy Questionnaire Answers

Based on the recapitulation of the answers to the self-efficacy questionnaire in Figure 2, it is found that on the indicators of Magnitude (belief in the level of task difficulty), General (belief in different tasks), and Strength (belief in certain tasks) most students choose answers on the TS scale (it is not in accordance with). Meanwhile, from the indicators of magnitude, general, and strength, at least the students gave answers on the SS scale (very appropriate). Based on the results of the recapitulation of the self-efficacy questionnaire answer scores, then the informant's results were categorized according to the PAN. Thus, from 36 students, the results are as presented in Table 1.

Table 1. Categorization of Self-Efficacy

Categorization	Amount	Percentage
High	8	22 %
Medium	22	61 %
Low	6	17 %

Table 1 shows the categorization of self-efficacy. It can be seen that most of the informants came from the medium self-efficacy category, namely as many as 22 informants. Furthermore, informants who are in the high and low self-efficacy categories, each as many as 8 and 6 informants. As for knowing the percentage based on table 1, the self-efficacy categorization can be presented as in Figure 3.
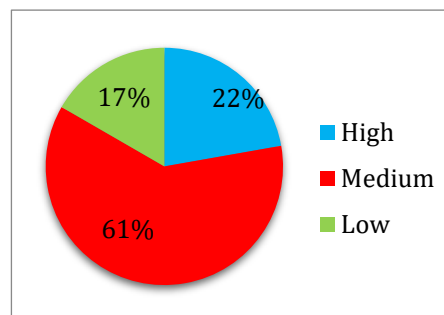
Figure 3. Percentage of Self-Efficacy Categorization

Figure 3 shows the percentage of self-efficacy categorization. It can be seen that the highest percentage comes from medium self-efficacy categorization with 61%. Furthermore, the percentage of the medium and the lowest score come from high and low self-efficacy categorization, 22% and 17%, respectively. Based on these results, 6 informants from each category were selected to be research subjects. The 6 informants who became subjects in this research are presented in Table 2.

Table 2. Informant Data

Student Code	Categorization
R1	High
R2	High
R3	Medium

R4	Medium
R5	Low
R6	Low

Table 2 shows the informant's data. Where informants who have high self-efficacy are coded R1 and R2, informants who have medium self-efficacy are coded R3 and R4, and informants who have low self-efficacy are coded R5 and R6. Then the six informants were given a mathematical literacy test. The results obtained are that informants who have high self-efficacy are able to answer mathematical literacy questions at level 1 to level 5, but are unable to formulate problems systematically, are unable to use the information obtained to solve the problems given, and are unable to interpret their assumptions about the problem given.

As for the results of the mathematical literacy answers of informants who have high self-efficacy, namely from R1 and R2, they are presented in Figure 4.

Figure 4. Results of Mathematical Literacy Test Answers R1 and R2

Figure 4 shows the result of the mathematical literacy test answers R1 and R2. It can be seen that the mathematical literacy test answers from informants who have high self-efficacy, namely R1 in questions number 1 and 2 with indicators of formulating, R1 is not able to formulate the problems given systematically. In questions number 3 and 4 with indicators of using and applying, R1 was able to identify some important parts of the given problem but did not use the information obtained in the form of a mathematical model. And at number 5 with interpreting indicators, R1 is able to provide its assumptions on the given problem, but it is not complete.

Informants who have other high self-efficacy, namely R2 in questions number 1 and 2 with formulating indicators, R2 is not able to formulate the problems given systematically. In questions number 3 and 4 with indicators of using and applying, R2 was able to identify several important parts of the given problem but did not use the information obtained in the form of a mathematical model. And at number 5 with interpreting indicators, R1 is able to

provide its assumptions on the given problem, but it is not systematic and complete and there are gaps.

The results of the mathematical literacy test answers from informants R3 and R4 who have medium self-efficacy are presented in Figure 5.

Figure 5. Results of Mathematical Literacy Test Answers R3 and R4

Figure 5 shows the results of the mathematical literacy test answers from informants who have medium self-efficacy, namely R3, in question number 1 with formulating indicators, R3 is not able to formulate the problems given systematically. In question number 2 with formulating indicators, R3 is able to formulate the given problem systematically. In questions number 3 and 4 with indicators of using and applying, R3 was unable to identify important information from the problems given. And in question number 5 with interpreting indicators, R3 is able to provide complete and precise assumptions about the problems given.

Other informants who have medium self-efficacy are R4, in question number 1

with formulating indicators, R4 is not able to formulate the problems given systematically. In question number 2 with formulating indicators, R4 is able to formulate the given problem systematically. In questions number 3 and 4 with indicators of using and applying, R4 was unable to identify important information from the problems given. And in question number 5 with interpreting indicators, R4 is able to provide its assumptions on the given problem but it is not complete.

The results of the mathematical literacy test answers from informants R5 and R6 who have low self-efficacy are presented in Figure 6.
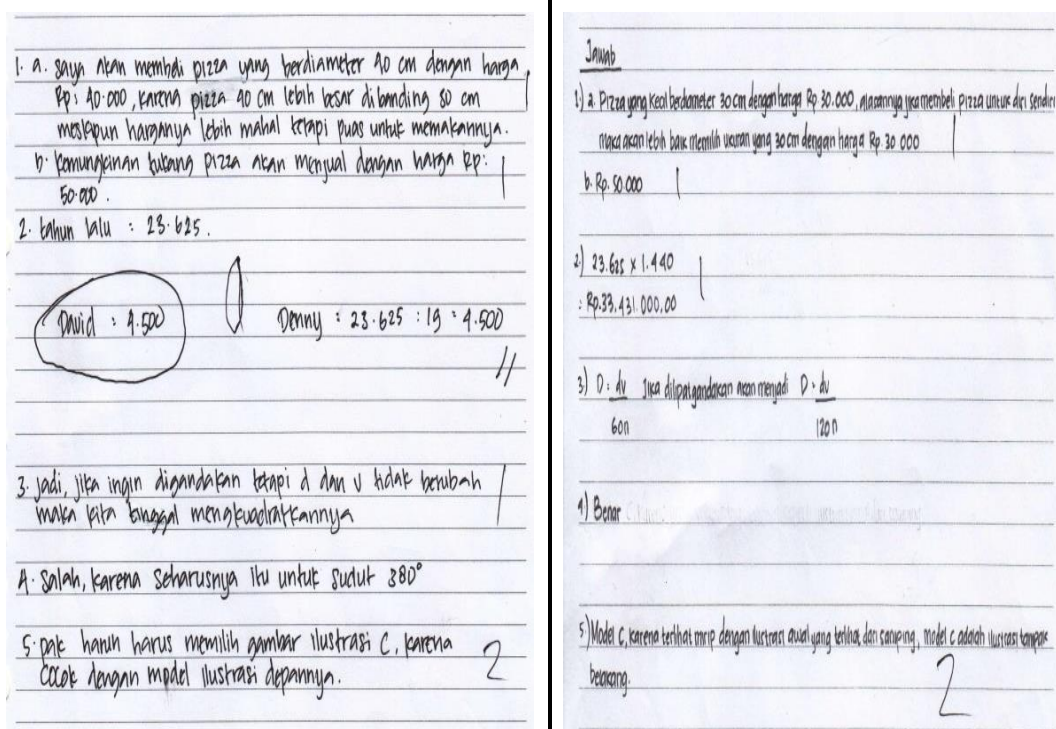
Figure 6. Results of Mathematical Literacy Test Answers R5 and R6

Figure 6 shows the results of the mathematical literacy test answers from informants who have low self-efficacy, namely R5, on questions number 1 and number 2 with indicators formulating, R5 is not able to formulate the problems given systematically. In questions number 3 and 4 with indicators of using and applying, R5 was unable to identify important information from the problems given. And in question number 5 with interpreting indicators, R5 is able to provide its assumptions on the given problem but it is not complete.

Another informant who has low self-efficacy is R6, in questions number 1 and number 2 with indicators formulating, R6 is not able to formulate the problems given systematically. In questions number 3 and 4 with indicators of using and applying, R6 was unable to identify important information from the problems given. And in question number 5 with interpreting indicators, R6 is able to provide its assumptions on the given problem but it is not complete. The scores obtained from the informant's mathematical literacy test based on the scoring guidelines are presented in Table 3.

Table 3. Mathematical Literacy Test Score Results

Code	Categorization of Self-Efficacy	Mathematical Literacy Score
R1	High	10
R2	High	10
R3	Medium	8
R4	Medium	7
R5	Low	5
R6	Low	5

Table 3 shows the results of the mathematical literacy test scores. R1 and R2 who have high self-efficacy get a score of 10, R3 who has medium self-efficacy gets a mathematical literacy test score of 8 and R4 gets a mathematical literacy test score of 7, and R5 and R6 which have low self-efficacy get a mathematical literacy test score of 5.

Based on the results of the analysis and discussion of the mathematical literacy answers of informants with high,

medium, and low self-efficacy. It can be concluded that the mathematical literacy skills of informants with high self-efficacy are able to complete the mathematical literacy test given even though the answers given to the indicators are formulating, using and applying, as well as interpreting and evaluating, the informants cannot formulate problems systematically, do not use and apply the information provided. Obtained into a mathematical form or model, as well as interpreting and evaluating the answer but it is not complete.

The mathematical literacy ability of the informants with medium self-efficacy was able to complete the mathematical literacy test with indicators formulating at level 1 mathematical literacy accurately, completely, and systematically. However, on the indicators of interpreting and evaluating informants who come from online learning (online) they are able to interpret and evaluate the arguments given completely. Meanwhile, informants with medium self-efficacy who come from offline learning (offline) are able to interpret and evaluate the results of the answers given in a complete and systematic way.

Mathematical literacy abilities of informants with low self-efficacy are only able to answer mathematical literacy questions on interpreting and evaluating indicators, but cannot correctly interpret their assumptions on the answers given. Based on this, it can be concluded that the higher the self-efficacy of the informant, the better or higher the mathematical literacy problem-solving ability given. The lower the self-efficacy of the informant, the lower the ability to solve mathematical literacy problems. This agrees with Endah et al. (2019) who state that self-efficacy has an important role in achievement motivation, is interconnected with the learning process that regulates oneself (independence), and mediate academic achievement. Furthermore, individuals who have high self-efficacy will have great confidence and effort in solving the problems given. Vice versa, individuals who have low self-efficacy may be unsure and easily give up on solving the problems given.

Based on the results of interviews conducted with informants with high self-efficacy, it was found that informants who have high self-efficacy are willing to try, and never give up to solve the problems given, even though the mathematical literacy answers given are not systematic and complete. Based on the results of interviews with informants who have medium self-efficacy, informants who have medium self-efficacy have difficulty in solving mathematical literacy questions on indicators using and applying facts, procedures, mathematical formulas that have been studied. So that the informant cannot provide answers or solve the problems given.

The next interview was conducted on informants with low self-efficacy. The results of the interview show that informants who have low self-efficacy find it difficult to understand problems in the form of stories. So, the answers given are not correct, not systematic, and incomplete. The cause of the low mathematical literacy ability is due to the infrequent use of story questions or problems related to everyday life that refers to the literacy skills of students, another thing is also due to the low learning independence of students in carrying out learning (Kholifasari et al., 2020).

Based on the results of the research, it seems that the cause of the low level of mathematical literacy is influenced by the independence of its learning. However, in the research researchers described the ability of student math literacy based on a high, medium, and low self-efficacy category. And because learning activities during Covid-19 are carried out online, then data collection is done online using

the Google-Form link and the spread of links through the WhatsApp Group.

CONCLUSIONS AND SUGGESTIONS

Based on the results of the research and discussion that have been presented, it can be concluded that: (1) Students with high self-efficacy are able to answer mathematical literacy questions level 1 to 4 with indicators of formulating, using, and interpreting, but not completely and systematically. (2) Students with medium self-efficacy are only able to solve level 1 mathematical literacy questions on indicators to formulate accurately, completely, and systematically. (3) Students with low self-efficacy are not able to solve mathematical literacy problems correctly, completely, and systematically.

Because the purpose of this research is to provide an overview of the mathematical literacy abilities of class X students of SMAN 1 Ciawigebang in terms of self-efficacy, where during the Covid-19 period learning activities were carried out online. So, based on the results of this research, the researchers suggest further researcher to be able to further explore the problems that cause the low value of PISA mathematical literacy with the classroom action research method and can be seen from other aspects.

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