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Analysis of mathematical literacy based on mathematical resilience of fifth grade elementary school students

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Abstract: This study aims to describe the literacy of students in solving mathematical literacy problems based on the level of mathematical resilience. This study used a case study qualitative research method. The research subjects were 20 grade V elementary school students for the 2020/2021 academic year. Data collection techniques using questionnaires, tests, and interviews. Processing the validity of data using technical triangulation techniques. Data analysis techniques using miles and hurry (reducing data, presenting data, drawing conclusions). The results of study showed that students with different levels of mathematical resilience have different mathematical literacy abilities. Students with high mathematical resilience have mathematical literacy skills, which are aspects of formulate, employ and interpret. Students with medium resilience have mathematical literacy skills, which are aspect of formulating problems, while students with low mathematical resilience do not have the three abilities of mathematical literacy.

Keywords: mathematical literacy, resilience, elementary school

PRELIMINARY

Mathematics is a branch of science that has an important role in human life. Mathematics is very necessary in daily activities (Hadiyanti et al., 2021). The development of science and technology is also very closely related to mathematics (Rizki & Priatna, 2019; Sholihah & Mahmudi, 2015). However, many students do not like mathematics (Syafitri et al., 2020).

21st century learning requires students to have knowledge and skills in all fields to be able to apply them to solve daily problems (Boholono, 2017). One of the 21st century abilities that students need to have is mathematical literacy (Child, 2016; Stacey, 2011). This is in line with the opinion (Kemendikbud RI, 2016) which stated that in learning students must participate actively, and provide opportunities for students to be creative and independent appropriate with the talents, interests, and physical and psychological development of students. Therefore, through education, students are

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expected to be able to develop critical, creative, and innovative thinking skills in solving problems.

Critical, creative, and innovative thinking skills can be developed through mathematics education. However, based on several research results, it showed that mathematics education is still considered difficult for students (Syafitri et al., 2020). This is due to students' low interest in mathematics (Yulia et al., 2021). According to (Ekawati et al., 2020; Maryani & Widjajanti, 2020) the negative attitude of students towards mathematics is that they think that mathematics has no benefits for the daily life of students.

The ability to process and utilize knowledge in daily life is called literacy (OECD, 2018; Stacey & Turner, 2015). Literacy skills that focus on everything related to mathematics are called mathematical literacy. In the Program for International Student Assessment (PISA) (OECD, 2018), mathematical literacy is the capacity of an individual to formulate, use, and interpret mathematics in various problem contexts. Mathematical literacy guides students to recognize the role of mathematics in life and make good decision making and judgments needed by constructive, and reflective people.

The results of the 2018 PISA, Indonesia only got a score of 379 for mathematical literacy, while the average was set at 489 (OECD, 2019). Based on the results of PISA, Indonesia ranks 74th out of 79 countries on the assessment of mathematical literacy. This indicates the low mathematical literacy of elementary school students (Priyonggo et al., 2021). In line with the research revealed by ((Handun et al., 2020; Putra et al., 2021) stated that the mathematical literacy of Indonesian students is still low.

Factors that affect student literacy include educational factors, personal factors, and student development factors (Mahapoonyanont, 2012). Personal factors in students besides cognitive aspects there are affective aspects of concern in mathematical literacy abilities. One of the affective aspects that influence the learning process is mathematical resilience (Johnston & Lee, 2010). Mathematical resilience is defined as a positive attitude towards mathematics that provides opportunities for students to continue learning mathematics despite facing difficulties. This is in line with research (Farman et

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al., 2021; Yeager & Dweck, 2012) which defined resilience as an emotional response to academic or social challenges that are positive or beneficial for development.

Several previous studies, that are research conducted (Asih et al., 2019) stated that mathematical resilience affects students' cognitive abilities. This is in line with research (Zanthy, 2018) which showed that mathematical resilience and students' academic abilities have a positive relationship. Resilience affects the intellectual abilities of students, because students with good resilience will be able to overcome obstacles to learning mathematics such as lack of self-confidence and learning anxiety (Komala, 2017). This is in line with (Johnston & Lee, 2010) who concluded that with resilience it is possible for students to overcome obstacles in learning mathematics, resulting from a lack of self-confidence, and anxiety in learning mathematics, and impacts on the intellectual abilities of students.

Based on some of the opinions of previous researchers, mathematical resilience is how a person can rise from difficulties in solving mathematical problems. To measure mathematical resilience, this study used indicators of mathematical resilience from (Nurfauziah & Fitriani, 2019) as follows: (1) perseverance, self-confidence, hard work, never giving up in facing math problems, failure and uncertainty; (2) has a sociable spirit, easily adapts to the environment and provides assistance to friends; (3) come up with new ideas or ways and look for creative solutions to challenges; (4) using the experience of failure to build self-motivation; (5) high curiosity, able to reflect, research, utilize various sources of knowledge; and (6) has the ability to communicate,
This study aims to describe how the mathematical literacy of elementary school students with high mathematical resilience, moderate mathematical resilience, and low mathematical resilience. This research provides a new description of how students' mathematical literacy skills are viewed from each level of mathematical resilience.

METHOD

This research was conducted at Grujugan Elementary School in the odd semester of the 2020/2021 school year. The research was carried out in November and December. This research was carried out using descriptive qualitative research methods(Creswell, 2013). The research approach used a case study approach in which cases are especially students with different levels of mathematical resilience.

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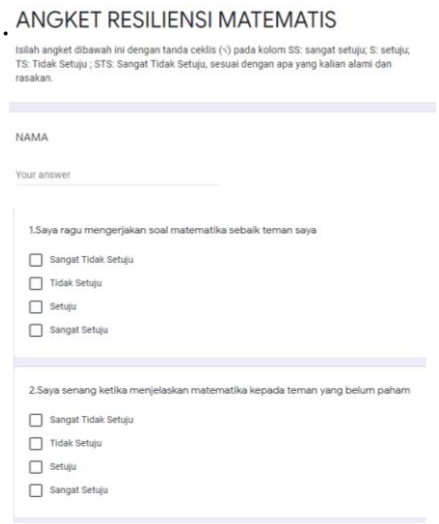
Research subjects were selected by purposive sampling technique, that is criterian sampling by considering high, medium, and low levels of mathematical resilience. Categorization used reference norms. The research subjects were 20 fifth grade students at SD Grujugan, with each level of mathematical resilience having 1 subject.

Data collection techniques using questionnaires, tests, and interviews. Supporting instruments for mathematical resilience questionnaires, mathematical literacy tests, and questionnaire interviews were used to categorize the level of students' mathematical resilience. Tests and interviews were used to collect data on mathematical literacy. The following is an example of a mathematical resilience questionnaire and a math literacy test.


ANGKET RESILIENSI MATEMATIS

Isilah angket dibawah ini dengan tanda ceklis (√) pada kolom SS: sangat setuju; S: setuju; TS: Tidak Setuju ; STS: Sangat Tidak Setuju, sesuai dengan apa yang kalian alami dan rasakan.

NAMA

Your answer

1.Saya ragu mengerjakan soal matematika sebaik teman saya

- Sangat Tidak Setuju
- Tidak Setuju
- Setuju
- Sangat Setuju

2.Saya senang ketika menjelaskan matematika kepada teman yang belum paham

- Sangat Tidak Setuju
- Tidak Setuju
- Setuju
- Sangat Setuju

Figure 1. Examples of Mathematical Resilience Questionnaire Items

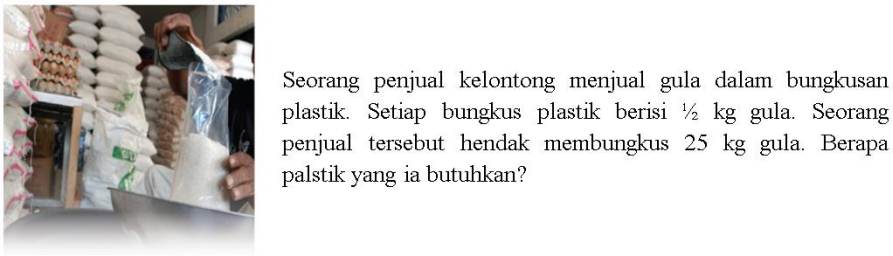


Figure 2. Mathematical Literacy Test Questions

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The technique of testing validity of the questionnaire instrument was used to test content validity and internal consistency. To test validity of the test instrument for critical thinking skills and guidelines, the content validity test was used by experts, they are two mathematics education lecturers and one mathematics teacher. The results of validity of the 30-item questionnaire trial showed that only 21 questionnaire items had an r count value that was more than equal to 0.433. The reliability of mathematical resilience questionnaire instrument with Alpha Cronbach with the SPSS-23 calculation obtained the value of r count (r_{11}) = 0.858 it was said that the item instrument had very high reliability.

The data analysis technique used is to recognize and organize data, reduce data and interpret data. Test the validity of data using triangulation, that is technical triangulation. Triangulation techniques is comparing students' mathematical literacy tests and the results of interviews.

Results

The research subjects were 20 fifth grade students at SD Grujugan. The grouping of levels of mathematical resilience is based on reference norms. The results of mathematical resilience questionnaire research were categorized into three levels of mathematical resilience, which are high, medium, and low. The average score of mathematical resilience questionnaire for all students is $\bar{X} = 61,,35$ and the standard deviation of the score for mathematical resilience questionnaire for all students is $s = 7{,}583$. So that the categories of students who have high mathematical resilience are obtained if $X > 65{,}142$, students who have moderate mathematical resilience if $57{,}559 \leq X \leq 65{,}142$, and students who have low resilience if $X < 57{,}559$ presented in the following table.

Table1. Mathematical Resilience of Class V SD Grujugan Students

Mathematical Resilience Level	Total	Percentage (%)
High	4	20
Medium	11	55
Low	5	25
Total	20	100

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Based on the data in Table 1. out of 20 students in class V SD Grujugan, which includes students with high resilience as many as 4 students, students who have moderate mathematical resilience are 12 students and students with low mathematical resilience there are 5 students. This showed that 55% of Grade V students at SD Grujugan have moderate mathematical resilience.

After classifying the level of mathematical resilience, tests and interviews were carried out on the mathematical literacy of three students with one student at each level of mathematical resilience.

The results of research are the work of students with high mathematical resilience as follows.

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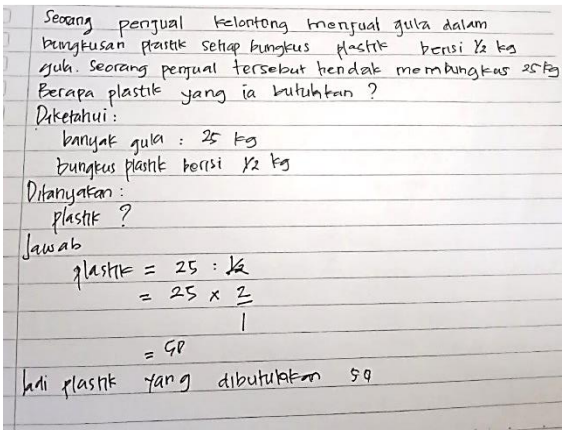

Figure 3. High resilience students' mathematical literacy test results

Figure 3 shows one of the works of students with high mathematical resilience. Subjects with high mathematical resilience work on one of the mathematical literacy test questions by writing down the information that is known and asked in full, writing down every step in solving the problem, and concluding the results of their work.

The results of students' work with moderate mathematical resilience are shown in Figure 4.

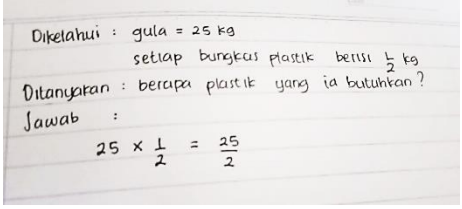

Figure 4. The results of students' mathematical literacy tests with moderate resilience

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Figure 4 shows one of the works of students with moderate mathematical resilience. Subjects with mathematical resilience are working on one of critical thinking skills test questions by writing information that is known and asked incompletely, writing down each step in solving the problem, and providing conclusions on the results of their work. The work results of students with low mathematical resilience are shown in Figure 5.

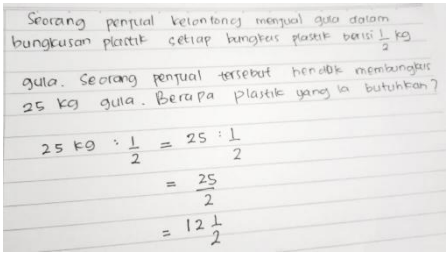

Figure 5. The results of students' mathematical literacy tests with low resilience

Figure 5 shows one of the works of students with low mathematical resilience. Subjects with low mathematical resilience worked on one of questions on critical thinking ability test, did not write down the information that was known and asked, wrote down the steps in solving the problem incompletely, and did not provide conclusions on the results of their work.

Discussion

Based on the results of data analysis, the researcher obtained some information regarding mathematical literacy, including: Subjects with high mathematical resilience for the formula indicator students were able to explain problems, change verbal problem statements into mathematical formulations, and analyze problems. Indicators employ students to design and implement strategies to find mathematical solutions and use mathematical tools. The interpret indicator is that students can interpret mathematical results back into the real world context.

Based on the results of data analysis, the researcher obtained some information regarding mathematical literacy including: Subjects with moderate mathematical resilience for the formula indicators students were able to explain problems, change verbal problem statements into mathematical formulations, and analyze problems. The employing indicators of students design and implement strategies to find mathematical solutions and use mathematical tools, but the strategies implemented are not correctly interpreted, which is students are unable to interpret mathematical results back to the real world context. It is characterized by no final conclusion from existing problems.

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Based on the results of data analysis, the researcher obtained some information about mathematical literacy including: Subjects with low mathematical resilience for formula indicators students were unable to explain problems, change verbal problem statements into mathematical formulations, and analyze problems. Indicators of employing students apply strategies to find mathematical solutions that are not appropriate and use mathematical tools. The interpret indicator is that students are unable to interpret mathematical results back into the real world context. It is characterized by no final conclusion from existing problems.

The research results are appropriate with the research conducted(Rokhmah et al., 2019; Zanthy, 2018), there was a significant and positive relationship between mathematical resilience and academic ability. Students with high mathematical resilience tend to have high academic abilities as well. This is also shown by the three research subjects, who can solve problems. Subjects with high mathematical resilience are able to solve problems based on three indicators of mathematical literacy.

Based on the research results, subjects with high mathematical resilience believe in the truth of their work. Students with mathematical resilience have the ability to grow their self-confidence, (John & Juandi, 2021; Zanthy, 2018). This shows that the subject has confidence in believing in the results of his work. In line with the research conducted (Johnston & Lee, 2010; Rokhmah et al., 2019) students with high mathematical resilience think that mathematics was not an obstacle, even when they experienced difficulties, they will maintain their confidence until the end.

Research conducted by (Mehrjerdi & Lotfi, 2019; Sterling, 2010) concluded that the transformative education paradigm of students who have resilience can develop social systems that are resilient in facing threats, uncertainties, and surprises in the future. This is in line with the results of this study, that is students who have high mathematical resilience are able to overcome the problems given to be able to provide conclusions from the problems presented. The lower level of mathematical resilience in dealing with problems or in this case the problem of mathematical literacy will be less related to the social system, which is said to be unusual in dealing with new threats. In this study, it can be seen in the inability part of low resilience students in understanding the problem.

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Conclusion

The ability of students' mathematical literacy in elementary schools is different. Based on the results of study it was concluded that students with different levels of mathematical resilience have different mathematical literacy abilities. Students with high mathematical resilience have mathematical literacy skills in the aspects of formulating, employing, and interpreting. Students with moderate resilience have mathematical literacy skills in formulating aspects or formulating problems. Meanwhile, students with low mathematical resilience do not have the three abilities of mathematical literacy.

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