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Students' Problem-Solving Ability Using Picture Story Contexts

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Abstrak

Kemampuan pemecahan masalah matematis menjadi salah satu komponen yang perlu dianalisis untuk mengetahui kemampuan peserta didik terhadap satu topik pembelajaran. Penelitian ini bertujuan untuk menganalisis kemampuan pemecahan masalah matematis peserta didik pada materi bangun datar, pengukuran panjang dan berat. Metode penelitian yang digunakan adalah kualitatif deskriptif. Instrumen pengumpulan data melalui tes, kuesioner, dan dokumentasi. Keseluruhan data tersebut dianalisis dan dideskrispsikan oleh peneliti. Subjek dalam penelitian ini adalah peserta didik kelas IV di salah satu sekolah swasta di Palembang berjumlah 14 orang yang diperoleh melalui purposive sampling. Hasil dari penelitian ini adalah kemampuan pemecahan masalah pada materi bangun datar dan pengukuran pada peserta didik kelas IV di salah satu sekolah swasta tersebut sebesar 75,59% yang artinya berkategori baik. Kemampuan pemecahan masalah peserta didik kelas IV perlu ditingkatkan terutama pada sesuatu yang sifatnya konkret dengan membiasakan peserta didik memberikan soal-soal berkonteks cerita yang mengarah ke AKM, PISA, dan HOTS kedepannya.
Kata Kunci: analisis; konteks cerita; pemecahan masalah.

Abstract

Mathematical problem-solving ability is one of the necessary components to analyze as it demonstrates students' ability to comprehend a learning topic. This study aimed to analyze students' mathematical problem-solving skills on flat shapes, measuring length and weight. This descriptive qualitative study used tests, questionnaires, and document analysis to collect the data. All of the data were analyzed and described by the researcher. The participants of the study were 14 fourth grade students in a private school in Palembang selected through purposive sampling technique. The study revealed that the students' problem-solving abilities on flat shapes and measurements scored 75.59%, which was categorized as "good". The problem-solving abilities of fourth graders need to be improved, especially on concrete objects by inuring students to story-context questions that promote AKM, PISA, and HOTS in the future.
Keywords: Analysis; Story Context; Problem Solving.

I. INTRODUCTION

Based on the results of the Program for International Student Assessment (PISA) in 2018, Indonesian reading skill was ranked 74th out of 79 countries, while the Mathematics and Scientific skills was ranked 73rd and 71st out of 79 participating countries. Indonesia's rank in the PISA assessment has been constant since the beginning of Indonesia's participation, from 2000 to 2018. (Hewi & Shaleh, 2020; Masfufah & Afriansyah, 2021). The PISA result is one of the bases to undertake an improvement in Mathematics skills. PISA categorizes the problem-solving skills into 6 levels. The unsatisfactory result of PISA implied lack of students' problem-solving skills, especially at the elementary school level. (Yuliasari, 2017; Polya, 1973; Purnomo & Sari, 2021). Besides, mathematical problem solving is an interesting phenomenon for most researchers (Asih & Ramdhani, 2019; Widodo, 2017; Sumartini, 2016; Istigosah & Noordyana, 2022)

This is in line with the results of interviews with several teachers in elementary schools implying that students were not accustomed to using problem solving problems with story contexts (Lisnani, 2019). Students often experience difficulties in solving math word problems because they relied very much on the teacher's assistances in the learning process. (Afriansyah et al., 2020; Sumartini, 2016). The researcher used context as one of the characteristics of the PMRI approach (Sembiring et al., 2010; Zulkardi, 2002; Gravemeijer, 1999; De Lange, 1996; Gravemeijer, 1994; Treffers, 1991; Afriansyah, 2022)

PMRI is an Indonesian adaptation of Realistic Mathematics Education, in which Mathematics learning is considered a human activity that must be linked to the context of students' daily lives. (Putri & Dolk, Maarten Zulkardi, 2015; Zulkardi, 2002; van den heuvel & Djivers, 2014). The context used can be in the form of everyday problems (van den Heuvel-Panhuizen, 2000; Utari et al., 2015; Fauziah et al., 2019; Putri & Zulkardi, 2019; Nuraida & Putri, 2019).

The use of contexts in learning mathematics allows the mathematical concept itself to be meaningful. The context brings abstract mathematical concepts into representations that are easy to understand. (Nasution et al., 2018). The researcher used the context of family-themed picture stories consisting of three topics, namely: Big Brother, Playing with Friends and Shopping which has been validated by several experts (Inharjanto & Lisnanto, 2018; Inharjanto & Lisnani, 2021; Inharjanto & Lisnani, 2020; Pratiwi, Komala, & Monariska, 2020). Based on the context of the picture story, the researcher designed questions regarding flat shapes, length measurement, and weight measurement. (Haris & Ilma, 2011; Afriansyah & Arwadi, 2021). Picture stories utilized by teachers enabled students to easily understand the learning topic (Pratiwi, Komala, & Monariska, 2020; Prastowo, 2014; Alam, 2022)

The mathematics materials used in this study are flat shapes and measurements consisting of length and weight measurements which are adapted to the mathematics learning at primary school level (Kemdikbud, 2018). This study aimed to analyze the mathematical problem-

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solving abilities of students using the context of picture stories.

II. METHOD

The research method used in this research is descriptive qualitative research (Sukmadinata, 2016). The analysis was carried out on contrasting students' answers. The participants of this study were fourth grade students in one of the private elementary schools in Palembang in the odd semester of the 2021/2022 academic year.

The sampling technique was non-probability sampling or purposive sampling, which resulted in the selection of 14 students as the participant of the study. The sampling criteria were the class taught by a model teacher called as *guru penggerak* or a teacher mover involving one class, namely class IVA in which students participated in face-to-face learning. The students analyzed were those with different answer strategies represented by students with low, moderate, and high ability based on the test results.

The data collection techniques utilized were tests, questionnaires, and document analysis. The test consists of 12 items of essay questions indicating the problem solving abilities: 1) understand the problem; 2) make a solution plan; 3) execute the solution plan; 4) check the solution results. (Hermawati et al., 2021; Nadhifah & Afriansyah, 2016) Then, the test results were collected and analyzed by the researcher to serve as the basis of decision making. The test results were analyzed for validity and reliability using SPSS 22.

The scores obtained were then categorized based on the level of students' problem solving ability described in Table 1. (Hermawati et al., 2021).

Table 1.
The Category of Mathematical Problem-Solving Ability

Achievement percentage	Category
75 < P < 100	High
60 < P ≤ 75	Moderate
0 < P ≤ 60	Low

The percentage of students' problem-solving ability in each category is determined by the following formula.

$$P = \frac{\sum score\ of\ each\ item}{maximal\ score} x100\%$$

The test covered geometry and measurement materials: flat shapes, length measurement, and weight measurement as described in Table 2.

Table 2.
Test Item Description

Question Number	Maths Concepts
1-4	Flat Buildings
5-7	Length Measurement
8-12	Weight Measurement

Meanwhile, the number of questionnaire items given were 8 questionnaire items. The data analysis technique utilized triangulation of the test and questionnaire results.

III. RESULTS AND DISCUSSION

At the initial stage, the researcher interviewed the teacher in the classroom upon the principal's approval. At this stage, the researcher asked the teacher's consent to the study. At the next meeting, the researcher discussed with the teacher regarding the questions and materials that would be given to students.

Based on the results of discussions between the researcher and the teacher, there were some revising related to the material and questions as follows:

1. The researcher offered three materials, namely flat shapes, measurement, and social arithmetic. However, the teacher suggested two materials, namely flat shapes and measurement.
2. The researcher prepared 16 questions for students to work on. However, the teacher considered 12 out of 16 questions that were appropriate with the learning topic later.
3. The modelling teacher revised some questions to be made easier for students to understand during the learning process.

The researcher prepared 12 question items related to flat building and measurement materials approved by the teacher to be given to students. At the next stage, the researcher and model teacher arranged a schedule to conduct the research, which was on 1st, 2nd, and 4th of November, 2021.

The procedure of the described as follows:

1. On 1st of November 2021, the teacher delivered the concept of flat shapes starting from the definition, types, area, perimeter, and various forms of problem-solving problems related to flat shapes to the students. Furthermore, students did the question items on flat shapes, namely questions number 1-4
2. On 2nd of November 2021, the teacher presented the materials weight and length measurement using Microsoft Power Point. Furthermore, students did the question items regarding length measurement, namely questions number 5-7 about length measurement.
3. On 4th of November 2021, the teacher gave the test items on eight measurement, namely numbers 8-12 about weight measurement.
4. Then the researcher analyzed students' answers on flat building material presented in Figure 1.

Figure 1. Problem About Flat Shapes

Figure 1 described a problem regarding flat shapes. This item allowed the students to analyze a rectangular *greeting card*. Based on the question, there were differences among students' answers given by student A, B, and C as shown in Figure 2(a), 2(b), and 2(c).

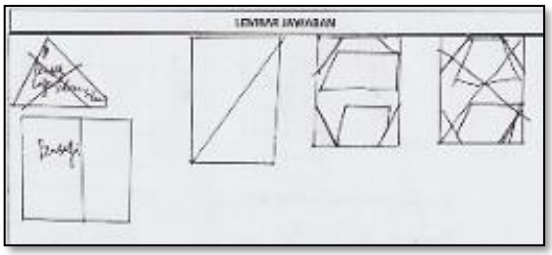

Figure 2(a). Low Ability Student's Answers

Figure 2(a) described the answers of a lower ability student were only able to construct two correct shapes while the other shapes were incorrect.

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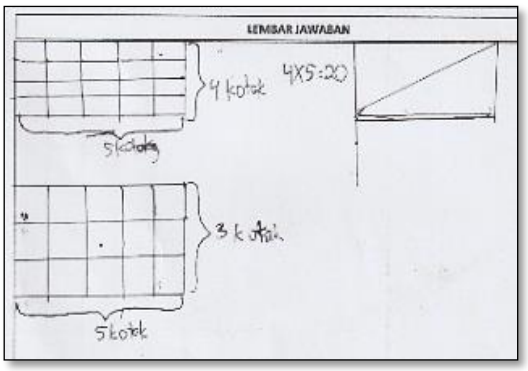

Figure 2(b). Moderate Ability Student's Answers

Figure 2(b) describes the answers of a student with moderate ability. The student provided a variety of answers by drawing rectangles and small squares.

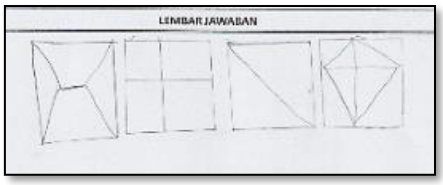

Figure 2(c). High Ability Student's Answers

Figure 2(c) describes the answers of a high-ability student who was able to make four correct shapes in forms of a trapezoid, kite, triangle and square.

The analysis of students' answers on length measurement material is presented in Figure 3.

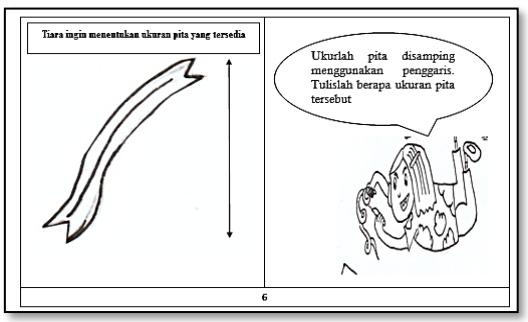

Figure 3. Length Measurement Items

Figure 3 described a question about length measurement. The objective of the item was to determine the students' ability to use a length measuring instrument in the form of a ruler. Based on the results of the analysis conducted by the researcher, it was discovered that the students' ability in measurement was not well developed. The students were not able to use length measuring instruments properly. There was one student demonstrating a distinctive problem-solving skill from the others as shown in Figure 4.

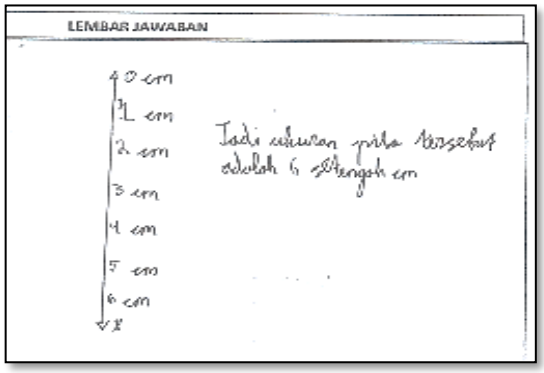

Figure 4. Student's Answer of Length Measurement

Figure 4 described the ability of a student measuring length using a ruler by redrawing the results of the measurements. This answer was different from the other answers. Other students directly wrote the number 6-7 cm.

The analysis of students' answers on length measurement material is presented in Figure 5.

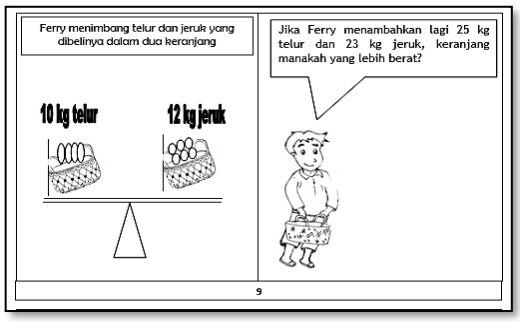

Figure 5. An Item of Weight Measurement

Figure 5 described an item regarding weight measurement to determine students' ability to compare the weight of two objects. Students were able to answer questions about weight comparison of two objects as shown in Figure 6.

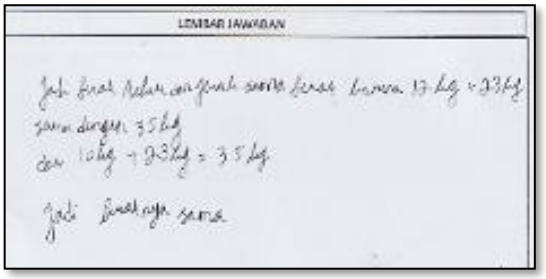

Figure 6. Student's Answer About Weight Measurement

Based on the results of the questionnaire, the responses of students related to 8 items of questions asked by the researcher are described in Table 3 below.

Table 3.
Questionnaire Recap Results

No.	Questionnaire Items	Learner Response
1	Is maths difficult?	85.71% of students stated that Maths was not difficult and 14.29% of students stated that Maths was difficult.
2	Which material do you find most difficult to understand?	A total of 42.86% of students stated that the difficult material was Flat Buildings, 42.86% of students stated that the difficult material was fractions and the remaining 14.28 stated that the difficult material was measurement.
3	Which maths material is easiest to understand?	A total of 42.86% of students stated that the easiest material was Flat Buildings, 42.86% of students stated that the easiest material was fractions and the remaining 14.28 said that the easiest material was measurement.
4	Have you ever learnt Maths using picture stories?	85.71% of students stated that they had learned mathematics using picture stories and 14.29% of students stated that they had never learned mathematics using picture stories.
5	Is learning maths through picture stories interesting?	A total of 92.86% of students stated that learning mathematics through picture stories was interesting and only 7.14% of students stated that learning mathematics through picture stories was not interesting.
6	Is learning maths through problem solving interesting?	A total of 78.57% of the students stated that learning mathematics through problem solving was interesting and only 21.43% of students stated that learning mathematics through problem solving was not interesting.
7	Are the test questions given different from the usual test questions?	28.57% of the students stated that the test questions were not familiar with the test questions. Meanwhile, 71.43% of the students stated that the test questions given were familiar with the test.
8	Did you find the questions easy to understand?	All students stated that the questions given were easy to understand.

Table 3 explains that most students had learnt to solve picture stories, which they found interesting. They also found that learning to use problem solving problems was interesting.

Researchers used picture stories as learning media (Fariyatul & Bandono, 2017).

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The use of media in the form of picture stories was further developed by the researchers in the form of mathematical problems that promoted problem solving skill and students' literacy.

A researcher along with a model teacher needs to analyze the mathematical problem-solving ability of their students so that the researcher and the teacher understand the ability of the students in solving mathematical problems. The mathematical problem solving ability of students varies from low, moderate, and high (Hermawati et al., 2021; Suryani et al., 2020).

The results of the analysis of each student were, as follows:

1. Analyzing question number 1, all students (100%) had understood and been able to answer the question correctly. The questions given by the researcher were open-ended.
2. the of question number 2, 12 students (85.71%) out of 14 students had understood the question well.
3. However, most students did not measure the greeting card first so there were errors in answering the question. In fact, the question instructed them to do measurements first.
4. The analysis of question number 3, only 6 out of 14 students (42.85%) were able to solve this problem correctly. Based on the results of the analysis and observations, students did not know how to use a ruler and did not understand the problem.
5. The analysis of question number 4¸ the students were able to solve the problem well even though students used a variety of techniques. students. 13 students (92.85%) were able to solve the question number 4.
6. The analysis of question number 5, all students (100%) were able to solve the problem correctly. This means that students understood the concept of length measurement.
7. The analysis of question number 6, none (0%) of the students was able to answer correctly. This means that students had not been able to use a ruler in measuring length.
8. The analysis of question number 7, 9 students (64.28%) were able to solve the question number 7. This means that students understood the problem quite well.
9. The analysis of question number 8, 12 students (85.71%) were able to solve the question number 8. This means that the ability of the students to answer question number 8 was good and the ability of students in the material of weight measurement and division operations was good.
10. The analysis of question number 9, 13 students (92.85%) were able to solve the question number 9. This means that the ability of students to understand the questions 9 is very good, including the ability to understand weight measurement and sum operations.
11. The analysis of question number 10, all students (100%) were not able to answer question number 10. This means that students were not able to measure the weight of an object using scales directly.

12. The analysis of question number 11, question number 11 is a follow-up question of the question number 10. All students (100%) were not able to answer the question as well as question number 10. In other words, the students did not understand the questions and were not able to do weight measurement using scales.
13. The analysis of question number 12, only 6 people (42.85%) out of 14 students were able to solve the question. some students were able to solve question number 12.

Based on the results of the analysis conducted by the researcher, it was revealed that students' understanding of flat shapes, conceptual length measurements were rather good, but they were not able to do measurements using a length measuring instrument in the form of a ruler properly. Besides, the students were not able to do weight measurement using scales properly. It was showed by the answers of the students to numbers 6, 10, 11, and 12. Students had difficulty working on questions number 6, 10, 11, and 12. Based on this analysis, the percentage of problem-solving ability was obtained as shown in Table 4 below.

Table 4.
Percentage of Problem-Solving Ability

Question Item Number	Problem Solving Ability
1	100%
2	85,71%
3	42,85%
4	92,85%
5	100%
6	0%
7	64,28%
8	85,71%
9	92,85%
10	100%
11	100%
12	42,85%
Average	75,59%

Table 4 describes the results of problem-solving skills using the context of picture stories was categorized as "high" with an average value of 75.59%. In addition, based on data collection.

According to the students' test results, they were analyzed into the four indicators of mathematical problem-solving ability in Table 5.

Table 5.
Percentage of Problem-Solving Ability

Indicators of problem-solving ability	Percentage of students' answers (%)	Category
Understanding the problem	35,71	Low
Make a solution plan	78,57	High
Executing the solution plan	71,43	Moderate
Checking the solution	50,00	Low

Table 5 describes that the most visible indicator is the ability to make a solution plan while the lowest is the ability to understand the problem. This is in line with the findings of several studies explaining that high ability of planning and executing encouraged students to find solutions to the provided problems (Roebyanto & Harmini, 2017; Morgan, 2020; Hermawati et al., 2021).

IV. CONCLUSION

Based on the findings of the study through a series of results of the analysis of students' abilities on flat building and measurement material based on 12 items given by the model teacher, it was concluded that most students were not able to measure the length of an object using a ruler, and measure the weight of an object using a scale. In addition, of the 12 items of

questions given, the students encountered difficulties to answer questions number 6, 10, 11, and 12. The ability of students to solve problems scored 75.59% which was categorized as "high".

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