

HOW STUDENTS SOLVE PIZZA PROBLEMS: AN EXPLORATION OF STUDENTS' MATHEMATICAL LITERACY

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Abstract

The pizza problem was chosen because the question consistently appears in every activity conducted by the Program for International Student Assessment (PISA) to measure mathematical literacy. However, Indonesian students have not yet successfully solved the pizza problem correctly. The purpose of this study is to describe the mathematical literacy of students in solving pizza problems that have been adapted in the process component and differences. This study focuses on students' answers in solving pizza problems with different information in each question. Data collection was carried out using tests and interviews. The research method employed is qualitative with a descriptive approach. The research subjects were ninth-grade junior high school students. Data collection was carried out to identify students' mathematical literacy on pizza problems by analyzing the results of tests and interviews. The results showed that: 1. students had difficulty in solving pizza problems, formulating mathematical problems, performing calculations using the concept of specific formula rules, and interpreting from a precise process correctly; 2. there are differences in students' answers in solving three types of pizza problems. Students did not solve pizza problems correctly through the correct calculation and interpretation, but on type 2 questions, students performed better than the students working on the other two problems. Students can easily understand the question with more detailed explanations. Therefore, in adapting a question from a foreign language, a careful, thorough, and accurate interpretation is required.

Keywords: Mathematical Literacy; Pizza Problems; Solving; Space and Shape

Abstrak

Masalah pizza dipilih karena pertanyaan tersebut selalu muncul dalam setiap kegiatan yang dijalankan oleh Program for International Student Assessment (PISA) untuk mengukur literasi matematis. Namun demikian, siswa Indonesia belum berhasil menyelesaikan masalah pizza dengan benar. Tujuan penelitian ini adalah mendeskripsikan literasi matematika siswa dalam menyelesaikan soal pizza yang telah diadaptasi pada komponen proses dan perbedaan jawaban siswa dalam menyelesaikan soal pizza yang telah diadaptasi dengan memberikan informasi yang berbeda pada setiap soal. Metode penelitian yang digunakan adalah kualitatif dengan pendekatan deskriptif. Subjek penelitian adalah siswa kelas 9 Sekolah Menengah Pertama. Pengumpulan data dilakukan untuk mengidentifikasi literasi matematis siswa pada soal pizza dengan menganalisis hasil tes dan wawancara. Hasil penelitian menunjukkan bahwa: 1. siswa kesulitan dalam menyelesaikan masalah pizza, siswa kesulitan dalam merumuskan masalah secara matematis, siswa belum mampu melakukan perhitungan menggunakan konsep aturan rumus tertentu; serta siswa belum mampu menafsirkan dari suatu proses matematis dengan benar; 2. terdapat perbedaan jawaban siswa dalam menyelesaikan 3 tipe soal masalah pizza yang diadaptasi, pada soal tipe 2 siswa menunjukkan kinerja lebih baik dibandingkan siswa yang mengerjakan dua soal lainnya. Oleh karena itu dalam mengadaptasi soal berbahasa asing maka harus mengartikannya dengan hati-hati, teliti dan cermat.

Kata kunci: Literasi matematis; masalah pizza; menyelesaikan; ruang dan bentuk



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INTRODUCTION

Mathematical literacy is one of the essential abilities to respond to challenges in the continuously changing era of globalization (Kolar & Hodnik, 2021). Someone with great mathematical literacy can understand the role and use of mathematics in formulating the right decisions for mathematical problems in everyday life (Annisavitri et al., 2020; Botha et al., 2013; Genc & Erbas, 2019; Guler & Arslan, 2019; Mardiana et al., 2020). Mathematical literacy can be interpreted as the capacity of individuals to formulate, employ, and interpret mathematics in various contexts, including making accurate deductions and applying mathematical concepts, procedures, facts, and tools to describe and predict phenomena (OECD, 2015; She et al., 2018; Stacey & Turner, 2015)

The Program for International Students Assessment (PISA) monitors results from student learning in each participating country. Essential aspects of mathematical literacy involve mathematics usage and mathematics processing in various situations (Gabriel et al., 2020; Holenstein et al., 2020; Ojose, 2011). PISA transforms the principles of mathematical literacy into three components, namely the content, process, and context components (Ahyan et al., 2014; OECD, 2021).

PISA results that measured the mathematical literacy skills of students aged 15 years in 2012 showed that Indonesia had a low ranking, 64th rank out of 65 countries. Furthermore, in 2015 showed that Indonesia was ranked 63 out of 70 states, and in 2018 Indonesia was ranked 72 out of 78 countries (Schleicher, 2019; Utaminingsih et al., 2021). These results are not encouraging, considering neighboring countries, such as

Singapore and Malaysia, are getting the highest ranks.

Mathematical literacy in Indonesia is lower than the prediction. As disclosed by Rusmining et al. (2014) the quality of education in Indonesia, including mathematical literacy at the international level, tends to be below, even though they have been given questions adjusted to the Indonesian context (Mahdiansyah & Rahmawati, 2014). Most of the students answered the mathematics questions without explanation and the calculation steps. Additionally, several other previous studies also investigated students' low mathematical literacy (Julie et al., 2017; Larasati & Rianasari, 2017; Linuhung, 2014; Rachmaningtyas et al., 2022; Wijaya, 2016). In a preliminary study in Junior High School 1 of Banjar Baru, Lampung, we gave students mathematical literacy test questions on space and shape content about the pizza problem. The pizza problem was chosen because this question was found in every activity carried out by PISA to measure mathematical literacy. However, Indonesian students did not solve the pizza problem correctly. Several other studies carried out in Indonesia using the pizza questions also reported students' difficulty in solving the problems (Dewantara, 2019; Johar, 2012; Kurniati et al., 2016; Noviana & Murtiyasa, 2020). However, those studies have not investigated Indonesian students' difficulty solving the pizza questions comprehensively.

The questions given to students have been adapted into the Indonesian context (Rupiah and Indonesian language). An example of a question is "Kedai Lupizza serves pizza in two different sizes with the same thickness but different sizes. A small pizza (A) with a diameter of 40 cm is sold at Rp.

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40,000.00. Large pizza (B) with a diameter of 50 cm is sold at Rp. 50,000.00. If you want to buy pizza, which size should you choose?"

The problem was given to 10 students. The results suggested that all students answered that they should select a small pizza (A) because its price was lower without providing a reason and correct calculation. An example of students' answers is presented in Figure 1 below.

Pizza A,
Kenapa saya memilih pizza A,
karena pizza A lebih murah harganya
daripada pizza B. Sehingga lebih
menghemat pengeluaran uang untuk
membeli pizza. Selain itu pizza A
lebih kecil dari pizza B.

Translation

Pizza A. I chose pizza A because pizza A is cheaper than pizza B, so I can save more money by buying pizza. In addition, pizza A is smaller than pizza B

Figure 1. Student answers

Based on the student's answers in Figure 1, students can only answer that Pizza A is cheaper because the price is low to save more money. Then the students were interviewed to know the reason for their answers. Based on their answers, students have not carried out a systematic process of formulating and implementing procedures, as well as interpreting the problems. Students understand the use of the desired question, but they do not know what to do to solve problems. Additionally, there are indications that students made mistakes in interpreting the words of the questions asked.

Various studies have been conducted to improve students' mathematical literacy by applying learning models or methods (Atsnan et al., 2018; Babys, 2017; Rusli & Anas,

2017). Besides, Research analyzing students' mathematical literacy skills in solving PISA mathematics problems was carried out by (Lestari et al., 2021), this study aims to measure students' abilities in mathematical literacy when facing PISA-type problems, including the Pizza problem. The research results show that students have difficulty translating everyday situations into mathematical form, including concepts, and structures, making assumptions, and mathematical modeling. Based on other studies, show that there has been no research that has investigated students' mathematical literacy processes in solving pizza problems with different explanatory sentences. Therefore, it is important to analyze how students solve pizza questions with varying information in each question.

This study explores how mathematical literacy in solving pizza problems is adapted to different explanatory sentences to determine the differences in the interpretation from the student's point of view. This study's importance lies in the attainment of information related to the reasons for students' difficulty in solving mathematical problems. Further, the information can be a reference in determining the right way to adapt mathematical literacy questions. Thus, this study aims to describe how is the mathematical literacy of students in solving pizza problems with different information in each question.

METHODS

In this study, the research method employed is qualitative with a descriptive approach. Descriptive analysis aims to portray a phenomenon, event, or situation that is currently occurring (Creswell, 2015). In this method, researchers strive to accurately

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depict the incidents or phenomena under study without manipulating or altering the existing data. The research procedure to obtain data is as follows: 1) Preparation: a preliminary study, and instrument development; 2) Data Collection: students solve the pizza problem, check students' answer sheets, and conduct student interviews; 3) Data Analysis: research data reduction, reading through all the data, checking data validity, presenting the structure; 4) Conclusion: drawing conclusions.

This research involved 60 ninth-grade students from SMP Negeri 1 Banjar Baru. The students were then randomly divided into three groups of 20 students each, and each group was given the adapted pizza problem test. Subsequently, 3 students were selected from each group who solved the problem accurately, resulting in a total of 9 research subjects.

The pizza problem from PISA adopted in this study is presented in the following.

"A pizzeria serves two round pizzas of the same thickness in different sizes. The smaller one has a diameter of 30 cm and costs 30 zeds. The larger one has a diameter of 40 cm and costs 40 zeds. Which pizza is better value for money? Show your reasoning".

In this study, the first group of students was given that question with an adapted question, from "Which pizza is better value for money" to "Which size do you choose to save money?" In the second group of students, the question was defined as "If you want to buy that pizza and money is not a problem for you because you can afford any kind of pizza as long as the choice is more profitable, then which size would you choose?" This statement is intended to ensure that students are not affected by

their allowance. In the third group of students, the question was altered to "Which pizza is more profitable in terms of the value for money?" These different explanatory sentences aim to explore whether different sentence interpretations may carry ambiguous meanings based on the student's point of view. The three questions that have been adapted are as follows:

Type 1:

Kedai Lupizza serves pizza in two different sizes with the same thickness but different sizes. A small pizza (A) with a diameter of 40 cm is sold at Rp. 40,000.00. Large pizza (B) with a diameter of 50 cm is sold at Rp. 50,000.00.

which size of pizza do you choose to save money?

- small pizza (A)
- large pizza (B)

Show your reasoning!

Type 2:

Kedai Lupizza serves pizza in two different sizes with the same thickness but different sizes. A small pizza (A) with a diameter of 40 cm is sold at Rp. 40,000.00. Large pizza (B) with a diameter of 50 cm is sold at Rp. 50,000.00.

If you want to purchase the pizza without having money issues, which size of pizza will you choose?

- small pizza (A)
- large pizza (B)

Show your reasoning!

Type 3

Kedai Lupizza serves pizza in two different sizes with the same thickness but different sizes. A small pizza (A) with a diameter of 40 cm is sold at Rp. 40,000.00. Large pizza (B) with a diameter of 50 cm is sold at Rp. 50,000.00.

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which pizza is better value for money?

- small pizza (A)
- large pizza (B)

Show your reasoning!

The instrument was validated by two expert validators in the fields of mathematics education and mathematics. Content validity was measured using a validation sheet to assess the appropriateness of the test instrument. Based on the validation results from both validators, the assessment concluded that the instrument is deemed appropriate and can be used to collect research data.

Furthermore, we used several techniques to assess the data validity. First, the extension of participation was completed by applying the involvement of researchers directly and for a long time. Second, data triangulation was carried out by utilizing something else outside of the data as a comparison of the data. Third, peer examination was carried out through discussion to compare and verify the truth and suitability of research data through analytic talks with colleagues and teachers in the mathematics field.

The data analysis conducted in this research involves three stages: data reduction, data presentation, and drawing conclusions (Miles et al.,

2014). In the data reduction stage, preparation and organization of data involve collecting notes, students' answer documents, and selecting interview results. In the data presentation stage, a cohesive theme is presented, such as examining students' answers, research objectives, and mathematical literacy content. This should be included to describe the content in mathematical literacy data using mathematical literacy indicators. Finally, in the drawing conclusions stage, research results are summarized.

RESULT AND DISCUSSION

In the data collection process, we gave three test questions to sixty students, with twenty students for each question. After that, we selected 3 students who wrote complete answers from each group. The first group of students was assigned questions similar to the questions issued by PISA, with modifications to the questions, from "Which pizza is better value for money" to "*ukuran mana yang kalian pilih, sehingga dapat menghemat uang?* (which size of pizza do you choose to save money)." The recapitulation of student completion results is presented in Table 1.

Table 1. Students' answers to question 1

No	Student	The answer	Process	Process Analysis
1.	Student 1	<p>Jawab:</p> <p><input type="radio"/> Pizza kecil (A)</p> <p><input checked="" type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p>Pizza B, alasannya saya memilih Pizza B karena dengan menambah Rp. 10.000 mendapat tambahan ukuran pizza diameter 10 cm.</p> <p>Answer: Pizza B, the reason I chose Pizza B is because by adding Rp. 10,000 rupiahs, I can get an additional size of a 10 cm diameter Pizza.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Not formulate a problem.</p> <p>Not applying specific formulas or rules.</p> <p>Interpreting and answering correctly. But, the answer shows that the student only guesses</p>

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No	Student	The answer	Process	Process Analysis
2.	Student 2	<p>Jawab:</p> <p><input type="radio"/> Pizza kecil (A)</p> <p><input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p>Pizza kecil A karena :</p> <p>Pizza kecil harganya Rp. 40.000,00 berukuran 40cm</p> <p>Pizza besar harganya Rp. 50.000,00 berukuran 50cm</p> <p>Untuk menghemat uang saya memilih pizza berukuran kecil karena menghemat uang.</p> <p>Pizza kecil dan pizza berukuran besar dan kecil hanya berbeda 10 cm dan berbeda harga Rp. 10.000,00 untuk menghemat uang lebih baik kita membeli yang kecil karena ketebalannya sama dan rasanya sama.</p> <p>Answer: A small pizza (A) because: The small pizza costs Rp. 40,000.00 measuring 40 cm A large pizza costs Rp. 50.000,00 measuring 50 cm I chose a small pizza to save my money because it saved money. Small pizzas and large pizzas differ only by 10 cm and differ in the price of Rp. 10,000.00. To save money, we better buy a small one because the thickness is the same and tastes the same.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Formulate the problem, but incomplete.</p> <p>Not apply specific formulas or rules.</p> <p>The student interprets, but the answer is wrong.</p>
3.	Student 3	<p>Jawab:</p> <p><input checked="" type="radio"/> Pizza kecil (A)</p> <p><input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p>Pizza (A) lebih hemat dan kecil dibanding pizza (B), sehingga kita bisa menabung.</p> <p>Answer: Pizza A, because Pizza A is smaller than Pizza B, so it saves more money and is cheap, so we can save.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Not formulate a problem.</p> <p>Not applying specific formulas or rules.</p> <p>The student interprets, but the answer is wrong.</p>

Based on the result of the interviews, it appears that the students may not fully understand that the issue at hand pertains to the width and thickness of the pizza, rather than just the price or the overall size of the pizza. Their responses suggest a lack of awareness or comprehension of the specific focus of the question or problem.

Student 1 chose pizza B based on its cost of only 10,000, without realizing that the actual issue is related to the width and thickness of the pizza. The response indicates that the student may have guessed the answers without a

clear understanding; Student 2 selected pizza A because of the lower price of a small pizza, allowing them to save money with only a 10 cm difference. However, the student is unaware that the issue involves the width and thickness of the pizza, indicating a misunderstanding of the question; Student 3 explained their choice of pizza A by stating it is more affordable, to save money. Nevertheless, they do not realize that the actual issue concerns the width and thickness of the pizza.

Overall, the interview highlights the students' lack of understanding regarding the question or problem, and

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their choices seem to be based on information that is not relevant to the actual aspect being tested.

Based on student answers in Table 1, and interview results to the type 1 problem, the students could not solve the given problem. Besides, one student systematically did problem-solving, but the answer was incorrect. The students perceive that money of Rp. 40,000 is less than Rp. 50,000, so they buy a small-sized and cheaper pizza. This finding indicated students' minimum knowledge in solving the problem. Besides, one student answered correctly, but without an exact calculation process, so they just guessed.

Furthermore, the second group of students was given a problem with additional information to ensure that students do not get affected by their allowance. Consequently, the price is no longer a problem, and students only have to choose which pizza is more profitable. The question for these second group of students is "Jika Anda ingin membeli pizza tersebut, bagi Anda uang bukan masalah karena anda mampu untuk membeli pizza jenis manapun asalkan pilihan tersebut lebih menguntungkan, maka ukuran mana yang anda pilih?" If you want to purchase the pizza without having money issues, which size of pizza will you choose?" The recapitulation of student results is presented in Table 2.

Table 2. Student answers to question 2

No	Student	The answer	Process	Process Analysis
1.	Student 4	<p>Jawab:</p> <p><input checked="" type="radio"/> Pizza kecil (A) <input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p>Pizza kecil harganya Rp. 40.000,00 berukuran 40 cm. Pizza besar harganya Rp. 50.000,00 berukuran 50 cm, jika kita ingin menghemat uang kita memilih pizza A, karena harganya lebih murah daripada Pizza B.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Formulating a problem but not complete</p> <p>Not applying specific formulas or rules</p> <p>Interpreting the solution, but the answer is wrong</p>
		<p>Answer: The small pizza costs Rp. 40,000.00 measuring 40 cm. The large pizza costs Rp. 50,000.00 measuring 50 cm, if we want to save money, we choose pizza A because the price is lower than Pizza B.</p>		
2.	Student 5	<p>Jawab:</p> <p><input checked="" type="radio"/> Pizza kecil (A) <input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p>Pizza A Lebih hemat dan Lebih kecil di banding Pizza B</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Not formulate a problem</p> <p>Not applying specific formulas or rules</p> <p>Interpreting the solution, but the answer is wrong</p>
		<p>Answer: Pizza A is more frugal and smaller than Pizza B</p>		

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No	Student	The answer	Process	Process Analysis
3.	Student 6	<p>Jawab:</p> <ul style="list-style-type: none"> <input type="radio"/> Pizza kecil (A) <input checked="" type="radio"/> Pizza besar (B) <p>Tunjukkan perhitungan anda!</p> <p>Harga pizza A : Rp. 40.000, berukuran diameter 40 cm.</p> $\text{Luas A} = \frac{22}{7} \times r \times r$ $= \frac{22}{7} \times 20 \times 20 = 1.257,1$ <p>Harga pizza B Rp 50.000 berukuran diameter 50 cm</p> $\text{Luas B} = \frac{22}{7} \times r \times r$ $= \frac{22}{7} \times 25 \times 25 = 1.964,2$ <p>Jadi pizza besar (B) luasnya jauh lebih besar padahal harganya hanya selisih Rp. 10.000. Jadi pizza B lebih menguntungkan.</p> <p>Answer: Pizza B, because Pizza B is bigger than Pizza A. The price of Pizza A is Rp. 40,000.00 measuring diameter of 40 cm. Area Pizza A = $\frac{22}{7} \times r \times r = \frac{22}{7} \times 20 \times 20 = 1257,1$. While the price of Pizza B: Rp. 50.000,00 measuring 50 cm and area Pizza B = $\frac{22}{7} \times r \times r = \frac{22}{7} \times 25 \times 25 = 1964,2$ So a large Pizza B is much bigger with a price difference of only Rp. 10,000.00, so a Pizza B is more profitable.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Formulating a problem</p> <p>Applying certain formulas or rules</p> <p>Providing the correct solution's interpretation and answer. But, one process has not been done, namely dividing the area of pizza by the price.</p>

Based on the interviews result, Student 4 stated that they chose pizza B because it was cheaper. They are aware that the issue involves the width and thickness of the pizza but are struggling with the calculations. This suggests that the student understands the nature of the problem but may lack the quantitative skills to perform the necessary calculations accurately; Student 5 mentioned choosing pizza A because of the lower price, without being aware that the issue involves the width and thickness of the pizza. This indicates a lack of comprehension regarding the specific focus of the question, as the student is emphasizing price rather than

the dimensions of the pizza; Student 6 explained their choice of pizza A by stating that the sizes are different, and based on the circular shape, they counted pizza B as wider. However, the student did not consider dividing the pizza by the price.

Overall, the interview reveals variations in students' levels of understanding and approach to the problem. Some students are aware of the nature of the issue but struggle with calculations, while others may focus on irrelevant factors or overlook certain aspects of the problem.

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Based on the results of the student's answers in Table 2, and interview, two students have not been able to solve the problem correctly. These two students presented the correct answer, but the calculation was still incorrect. Student 5 answered Pizza B, but the reason for choosing Pizza B was because by adding Rp. 10,000 rupiahs, the student can get an additional size 10 cm diameter Pizza. This student did not do the exact calculation, and the reason given did not represent a solution because the answer was incorrect. Additionally, student 6 only missed the calculation of the price for every cm^2 of the pizza by dividing prices by the area. Instead, student 6

answered with a suspicion that Pizza B is far greater than Pizza A with a different price of only Rp. 10,000. It turns out that the student's answer is correct. Although there is a possibility that the student's answer is wrong, at least this shows that students can formulate, employ, and interpret problem-solving.

Furthermore, the third group of students was given the same question from the source, "Which pizza is better value for money" which translated into "*Pizza mana yang lebih menguntungkan dilihat dari nilai uangnya?*" The recapitulation of student results is presented in Table 3.

Table 3. Student answers to question 3

No	Student	The answer	Process	Process Analysis
1.	Student 7	<p>Jawab:</p> <p><input checked="" type="radio"/> Pizza kecil (A)</p> <p><input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p><i>Pizza A, Karena pizza A lebih kecil dari pada pizza B jadi lebih menguntungkan dari nilai uangnya Karena lebih murah.</i></p> <p>Answer: I chose Pizza A because Pizza A is smaller than Pizza B, and it is more profitable from the value of money because it is cheaper.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Not formulate a problem</p> <p>Not applying certain formulas or rules</p> <p>Present interpretation, but the answer is wrong</p>
2.	Student 8	<p>Jawab:</p> <p><input checked="" type="radio"/> Pizza kecil (A)</p> <p><input type="radio"/> Pizza besar (B)</p> <p>Tunjukkan perhitungan anda!</p> <p><i>Saya memilih Pizza A karena Pizza A lebih murah harganya daripada Pizza B sehingga bisa menghemat uang.</i></p> <p>Answer: To save money, I chose Pizza A because Pizza A is more inexpensive than Pizza B.</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Not formulate a problem</p> <p>Not applying certain formulas or rules</p> <p>Present interpretation, but the answer is wrong</p>

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No	Student	The answer	Process	Process Analysis
3.	Student 9	<p>Jawab:</p> <ul style="list-style-type: none"> o Pizza kecil (A) o Pizza besar (B) <p>Tunjukkan perhitungan anda!</p> <p>Pizza kecil Rp. 40.000, ukuran 40 cm Pizza besar Rp. 50.000, ukuran 50 cm</p> <p>Jawab :</p> <p>• Ukuran pizza kecil = $\pi \times d = 3,14 \times 40$ $= 125,6$</p> <p>harga Rp. 40.000, maka $\frac{Rp. 40.000}{125,6} = 318,47$,</p> <p>Jadi harganya 318,47.</p> <p>• Ukuran pizza besar = $\pi \times d = 3,14 \times 50$ $= 157$</p> <p>harga pizza B Rp 50.000 maka $\frac{Rp. 50.000}{157} = 318,47$.</p> <p>dari hasil itu harganya sama, jadi pizza A atau pizza B sama-sama menguntungkan</p> <p>Answer: small Pizza is Rp. 40,000.00 measuring diameter of 40 cm. big Pizza is Rp. 50,000.00 measuring diameter of 50 cm</p> <p>Answer: The size of a small Pizza = $3.14 \times 40 = 125.6$ with the price of Rp. 40,000.00 so Rp. 40,000, 00: $125.6 = 318.47$, so the price is Rp. 318.47 Size Pizza Big = $3.14 \times 50 = 157$ with Rp. 50,000.00, so Rp. 50,000, 00: $157 = 318.47 \text{ cm}^2$, so the price is Rp. 318.47 from the result that the price is the same the selection of Pizza A or Pizza B is equally profitable</p>	<p>Formulate</p> <p>Employ</p> <p>Interpret</p>	<p>Formulate a problem</p> <p>Apply certain formulas or rules</p> <p>Making interpretation and the answer correct</p>

Based on the result of the interviews, Student 7 chose pizza A because it is cheaper, but the student is not aware that the issue involves the width and thickness of the pizza. This suggests a lack of understanding regarding the specific focus of the question; Student 8 stated that they chose pizza A because its price is lower, without being aware that the issue involves the width and thickness of the

pizza; Student 9 explained choosing pizza A after calculating the price and finding it to be the same. In summary, the common theme in these responses is a focus on the price of the pizzas, indicating a lack of awareness among the students that the issue being discussed pertains to the width and thickness of the pizza.

Based on student answers in Table 3, and interview, students have not been

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able to solve the given problem. However, one student can formulate and employ certain formulas. This student understood that this concept is a concept, but the student applied the formula around a circle to get the wrong conclusions. The results of the calculation were small pizza size = $\pi \times d = 3.14 \times 40 = 125.6 \text{ cm}^2$, so the price of Rp. 40,000.00: $125.6 = \text{Rp. } 318.47$ every cm^2 . While the size of a large pizza = $\pi \times d = 3.14 \times 50 = 157 \text{ cm}^2$, the price of Rp. 50,000.00: $157 = 318.47$ every cm^2 . From that calculation, the price is the same, so pizza A or pizza B is equally beneficial. There is a misconception here, and students are swapped between the formula of area and periphery of a circle. After the interview, the student forgot the formula of a circle area and used the formula for circle perimeter $\pi \times d$ instead. Student 7 chose Pizza A because Pizza A was smaller than Pizza B, so it was more profitable since it was cheaper than other types of pizza. Student 8 chose Pizza A because Pizza A is cheaper than Pizza B to save money. Then interviews were also conducted for students 7 and students 8. The interview results indicated that they already knew the purpose of the problem but did not know the procedures to solve the problem.

Based on the obtained research results, students still face several difficulties in solving pizza problems. Question type 1, the results suggested that students have not been able to solve the problems. For students, the money of Rp. 40,000 is less than Rp. 50,000, so buying a small-sized and cheaper pizza A is the best choice for students since they do not know what to do to solve problems. For question type 2, two students have not been able to solve the problem correctly, and one student

answered correctly. However, the reasons and calculations from this one student are still not right. Ideally, students must be able to identify the assumptions and arguments being used, assess the logic of the arguments on which they are based, identify other things that might be better, and make the right decisions. In question type 3, the results of students' answers indicate that students have not solved the given problem. However, one student can formulate and employ specific formulas, presenting an excellent understanding that this concept is a concept. However, the student applies the formula of a circle perimeter and gets the wrong conclusions.

The results show differences in students' responses to the three provided pizza problems. Students did not solve pizza problems correctly through accurate calculations and interpretations. However, on type 2 questions, a student performed better than the others. Our data suggest that students can understand questions more easily with more detailed explanations. Aligned with previous research conducted by Lestari et al. (2021), indicating that students have difficulty translating everyday situations into mathematical form, including concepts, and structures, making assumptions, and mathematical modeling. Therefore, the findings of this study provide further insight that these difficulties are attributed to the language used in adapting mathematical literacy problems from English to Indonesian, which lacks careful, thorough, and accurate translation. The strengths of this research indicate that the careful and precise adaptation of questions can aid students in better understanding mathematical problems.

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As revealed by Moschkovich & Zahner (2018), a guide to mathematical literacy can be used to design a mathematics learning experience in a multilingual classroom. In addition to using such guides for assignment design, the design of instructions that provide opportunities for the development of mathematical literacy should also consider the assignments. These two elements are inseparable in the class and affect the structure of activities for each assignment, texts, and contextual aspects for other relevant mathematical activities in each classroom setting. The context used in the classroom must be chosen to help students understand the meaning in real life (Bolstad, 2020; Geiger et al., 2015; Machaba, 2018; Pillai et al., 2017). In solving pizza problems, it is necessary to present to students the terms from the real world that must be interpreted because mathematics is a mathematically organized science with intercorrelated mathematical ideas (Altun & Bozkurt, 2017; Rawa et al., 2016). Therefore, in adopting a foreign language problem, the problem must be interpreted carefully, thoroughly, and carefully.

CONCLUSION AND SUGGESTION

The study found that students face difficulties in solving pizza problems, formulating mathematical problems, applying mathematical concepts, and interpreting mathematical processes correctly. The most challenging aspect for students was applying mathematical concepts to solve problems. The study in students' answers in solving three types of pizza problems. Students did not solve pizza problems correctly through the correct calculation and interpretation, but on type 2 questions, students performed better than the

students working on the other two problems. Students can easily understand the question with more detailed explanations. Therefore, in adapting a question from a foreign language, a careful, thorough, and accurate interpretation is required.

We suggest educators design questions that adapt foreign language questions into the mother tongue and interpret them thoroughly and carefully. Educators should also report the students' characteristics, the texts involved, and relevant contextual aspects. Furthermore, for future research stemming from this study, a broader investigation could be conducted, involving a more extensive pool of students from various educational levels and diverse backgrounds.

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