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DIDACTICAL SITUATION ANALYSIS OF MATHEMATICAL LITERACY SKILLS BASED ON STUDENTS' LEARNING OBSTACLES ON SPACE AND SHAPE CONTENT

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ABSTRACT

Mathematical literacy is an important skill in dealing with 21st-century skills. One of the components of mathematical literacy that must be mastered is the literacy ability of space and shape content. Several factors affect students' mathematical literacy skills, including learning obstacles. This study aims to analyze the didactical situation of mathematical literacy skills based on students' learning obstacles on space and shape content. The research method used is qualitative research with a descriptive approach. The subjects in this study were VIII grade students of SMP Pesantren Guppi Samata. Data collection was carried out using mathematical literacy tests on space and shape content with flat-sided space building material, interviews, and questionnaires. The results showed that students faced several learning barriers in understanding mathematical concepts and skills on flat-sided space-building material's Space and Shape content. These barriers include difficulties in understanding and formulating situations mathematically by making mathematical models, applying mathematical concepts, facts, procedures, objects and reasoning to solve geometry problems, and evaluating and interpreting the results. Based on the findings of this study, it is recommended that mathematics teachers identify the barriers students face in learning Space and Shape content. Furthermore, teachers can adopt appropriate learning approaches and strategies to help learners overcome these barriers. The use of visual aids, simulations, and group discussions can be effective alternatives in improving learners' mathematical literacy.

Keywords: Didactical analysis; mathematical literacy; space and shape

1. INTRODUCTION

Education is an effort to become a whole person (both outwardly and mentally), both towards oneself and others, so that learners think, feel, speak, and act with full awareness and confidence in taking responsibility every day for every action and behavior (Buaton et al., 2021). Education plays an essential role in producing quality human resources because it will affect technological advances in various fields (Wahyuningsih, 2022). One of the efforts that can be made to encourage the progress of the education system is to improve the learning process in the classroom by overcoming various obstacles in students' learning process. Improving the quality of learning needs to be pursued for all subjects, including mathematics. In the world of education, mathematics is one of the subjects that has a significant role (Damar Danishwara & Nadya Alvi Rahma, 2023). Almost all fields of study involve mathematical sciences. Therefore, everyone must learn and master mathematics to be used to solve everyday life problems (Purwasih et al., 2018). In the world of education, it is inseparable from mathematics subjects, ranging from elementary school to college, and the number of lesson hours is more than other subjects ((Fahlevi & Zanthy, 2020; Ananda & Wandini, 2022). Increasing competence in mathematics subjects at every level of education is an urgent need to ensure that individuals have a solid foundation in understanding mathematics, so that they can face the challenges of an increasingly complex world with confidence and adequate ability.

Mathematics is defined as a method of thinking used to solve all kinds of problems in various dimensions of life. This is proof that mathematics has an important role in everyday life. However, in reality mathematics is a subject that students from various levels of education still fear. This mostly happens due to a decrease in student interest and motivation in mathematics lessons which is one of the consequences of the difficulties experienced by students when learning mathematics. The difficulties experienced by students start from difficulty understanding the material delivered in class, so this causes students to be less able to solve the questions given. Some obstacles in mathematics are considered difficult due to abstract mathematical concepts that become obstacles for students to understand (Wahyuningsih, 2022; Alisnaini et al., 2023). When students encounter symbols and formulas in mathematics, they often find it difficult to relate these concepts to real situations or practical applications in everyday life. Therefore, math educators need to help students understand the relevance and application of mathematical symbols and formulas in more tangible and meaningful contexts.

The ability of mathematical literacy in space and shape content is one of the important aspects of learning mathematics students in order to face the demands of the 21st century. According to the OECD (2015) mathematical literacy is an individual's capacity to formulate, use, and interpret mathematics in a variety of contexts. It includes mathematical reasoning and the use of mathematical concepts, procedures, facts and

tools to describe, explain and predict phenomena. Mathematical literacy is one of the competencies measured through the Programme For International Students Assessment (PISA). The PISA test is an international test that compares and assesses how the education system prepares students to deal with real-life situations (Haara et al., 2021). The PISA framework for measuring mathematical literacy is distinguished in three constructs: content, context, and cognitive. According to Usman &; Kristiawati (2022), mathematical literacy ability is the ability to know and apply basic mathematics in everyday life. Mathematical literacy is important and needed in students' lives, but this is not in line with PISA's research to determine students' mathematical literacy abilities. Students' mathematical literacy in Indonesia is still low, as seen from research conducted by the Programme For International Students Assessment (PISA) (Purwanti et al., 2021). The mathematical literacy ranking of Indonesian students from 2009 to 2015 did not show a significant increase.

In 2009 Indonesia was ranked 68 out of 74 countries. In 2012 Indonesia ranked 64th out of 65 countries with a relatively low level of achievement. Meanwhile, the PISA results in 2015 showed that Indonesia's ranking experienced a slight increase in order, namely 63 out of 72 countries (Ayuningtyas & Sukriyah, 2020). Even when compared to Vietnam, a small country in Southeast Asia that has just become independent, Indonesia's PISA test results (2015) are very far apart. Vietnam scored 495 (with an average score of 490), while Indonesia scored 387 (Han et al., 2017). Therefore, it is imperative to address and improve the mathematical literacy skills of Indonesian students, by implementing effective strategies and interventions to encourage deeper understanding and application of mathematical concepts in real-life contexts. Collaborative efforts among educators, policymakers, and other stakeholders are needed to improve mathematical literacy and equip students with the skills necessary for the demands of the 21st century.

Talking about the components of mathematical literacy content, space and shape is one of the contents that must be understood. Space and shape content in mathematical literacy is related to the understanding of space, shape, dimensions and geometric relationships between these objects. Geometry (Space and Shape) is a topic related to cognitive and constructivist learning theory. In studying this topic, students are required to think critically, visualize, analyze, describe, construct, and find answers to solve questions. Ideas and knowledge will be constructed through a learning process to master the concepts in the topic (Ismail & Abdullah, 2020). One of the materials that become an important foundation in geometry literacy is flat-sided space. However, in the learning process of flat-sided geometry, students often face obstacles or difficulties that affect their mathematical literacy skills. These obstacles can be in the form of difficulties in understanding basic geometry concepts, difficulties in applying solution algorithms, or difficulties in communicating their understanding effectively. This is evidenced by research by Fahlevi & Zanthy (2020) which found that students experience difficulties in both

understanding concepts, applying principles and skills in working on flat-sided space building problems. In addition, Elfiah et al. (2020) also stated that students in flat-sided space building material, such as conceptual obstacles, procedural obstacles, and operational technique obstacles obtain several obstacles. Not only students with low mathematics ability who experience difficulties, but students with high and moderate mathematics ability also experience difficulties in solving mathematical description problems.

If learners experience obstacles in their learning process (learning obstacles) then these obstacles can cause learners to fail or at least be less successful in achieving learning goals. This is where the task of a teacher is to minimize the obstacles that can arise in the learning process, for example, conducting a didactical analysis based on students' learning obstacles. Didactical analysis is an approach that involves understanding and analyzing the learning barriers learners face in the context of learning. According to Sulistiawati et al. (2015) in the didactical triangle, the teacher's role is to create a didactical situation so that the learning process occurs in students. These efforts have been known as Didactic and Pedagogical Anticipation (ADP) is a synthesis of the results of teacher thinking based on various possibilities that are predicted to occur in learning events. Suryadi, (2013) states that one aspect that needs to be considered by teachers in developing ADP is the existence of learning obstacles. By recognizing and addressing learning obstacles, teachers can create a supportive and conducive learning environment that empowers students to overcome challenges and achieve their full potential in their educational journey.

This research is in line with research conducted by Sulistiawati et al., (2015) which found that the didactical design developed can minimize the gap faced by students. The mathematical reasoning ability of students increases as seen from the reduction of difficulties experienced by students in solving mathematical reasoning problems. Furthermore, research by Siti Aisah et al., (2016) which revealed that the didactical design that has been prepared is quite effective to be applied in learning the concept of surface area and volume of prisms. Another study was also conducted by Putri et al., (2020) which suggested that the implementation of didactical design shows that the didactical design provided can overcome students' learning obstacles with a decrease in the percentage of students who experience difficulties.

Therefore, this study aims to conduct a didactical analysis of learners' mathematical literacy based on learning obstacles on space and shape content. By analyzing these barriers, it is hoped that a more effective learning strategy can be found in improving students' mathematical literacy. Thus, this research is expected to contribute to the development of mathematics teaching approaches that can address learning obstacles,

thereby promoting the improvement of students' mathematical literacy in space and shape.

2. METHODS

The type of research used is descriptive qualitative research. Qualitative research was chosen to provide a deeper understanding of the phenomenon under study. As stated by Nurdin & Hartati (2019), qualitative research does not generalize but emphasizes the depth of information to reach the level of meaning. The research design used is Didactical Design Research (DDR). Suryadi (2013) suggested that Didactical Design Research (DDR) basically consists of three stages, namely: (1) analysis of the didactical situation before learning in the form of Hypothetical Didactical Design, (2) metapedidactic analysis, and (3) retrospective analysis. This study will focus on stage one, namely the analysis of the didactical situation in the form of didactical relationships (learner-material) revealed through mathematical reasoning based on learning obstacles.

The subjects to identify learning obstacles in this study were students of class VIII of SMP Pesantren Guppi Samata. The data collection techniques used in this study were tests, interviews, and questionnaires. The test used in this study is a 5-item mathematical literacy test to measure students' mathematical literacy skills on flat-sided space building material as well as an analysis material to identify learning obstacles experienced by students. This test is arranged according to the content (space and shape), cognitive level (understanding, application, reasoning), and context (personal, socio-cultural, work, scientific) of mathematical literacy. Furthermore, interviews were conducted when students worked on test instruments or after working on test instruments so that the difficulties experienced by students could be identified. Meanwhile, questionnaires were used to collect additional information related to learning obstacles experienced by students.

The mathematical literacy indicators (Sari & Wijaya, 2017; Rizki & Priatna, 2019; Susetyawati & Kintoko, 2022; Qadry et al., 2022) used can be seen in table 1.

Table 1. Indicators of Mathematical Literacy

No.	Indicator	Sub Indicators
1.	Understand and formulate situations mathematically by creating a mathematical model of a problem.	1). Understand mathematical problems and formulate effective problem-solving strategies. 2). Represent information or problems in appropriate mathematical form. 3). Use mathematical models to draw a concrete state of a problem.
2.	Apply mathematical concepts, facts, procedures, objects and reasoning to solve problems.	1). Identify mathematical concepts relevant to the given problem. 2). Using relevant mathematical facts or procedures in performing calculations to solve problems. 3). Apply effective mathematical problem solving strategies.
3.	Interpret, use, evaluate and interpret the results obtained mathematically.	1). Evaluate the accuracy of the mathematical results that have been obtained. 2). Communicating mathematical results in a clear and structured manner. 3). Interpret the relevant meaning of the mathematical results obtained in the given problem or situation context.

Furthermore, the test grid can be seen in Table 2.

Table 2. Lattice of Flat-Sided Spatial Buildings Problems

Indicator	Cognitive Level	Context	Question No.
Identify the properties of flat-sided spaces	Understanding	Jobs	1
Determining the surface area of a flat-sided space	Application	Personal	2
Calculating the volume of a flat-sided space by applying geometry principles	Application	Social Culture	3
Solve real problems related to the equations of flat-sided spaces	Reasoning	Personal	4
Solve real problems related to flat-sided spaces	Reasoning	Scientific	5

3. RESULTS AND DISCUSSION

To identify students' learning obstacles, first a mathematical literacy test was given to 6 students of class VIII of SMP Pesantren Guppi Samata who were present when the research was conducted. This test also aims to determine the students' mathematical

literacy skills on flat-sided space-building material. The results of the math literacy test are in Table 3.

Table 3. Test Results of Mathematical Literacy Skills on Flat-Sided Room Building Materials

No.	Learner Name	Learner Score	Category
1.	A1	58	Very Low
2.	A2	4,4	Very Low
3.	A3	47	Very Low
4.	A4	4,4	Very Low
5.	A5	31,1	Very Low
6.	A6	42,2	Very Low
	Total	**187,1**	**Very Low**
	Average	**31,2**	

From Table 3 it can be seen that the students' mathematical literacy skills are in the very low category. In this study using criteria, namely, very high ($93 \leq x \leq 100$), high ($85 \leq x \leq 92$), medium ($77 \leq x \leq 84$), low ($69 \leq x \leq 76$), very low ($x < 69$). Of the 6 people studied, none were in the very high, high, medium, low categories, and 6 were in the very low category. Based on the average of the students' scores obtained (31,2), it can be concluded that the students' mathematical literacy skills are still very low.

The data obtained from students' solutions were also analyzed based on mathematical literacy indicators. This is done in order to obtain a more structured picture of mathematical literacy skills. The percentage of correct answers for each item was made to make it easier to see how many students answered correctly. The percentage of students' correct answers for each item per indicator can be seen in Table 4.

Table 4. Percentage of Students Answering Correctly based on Stages of Mathematical Literacy

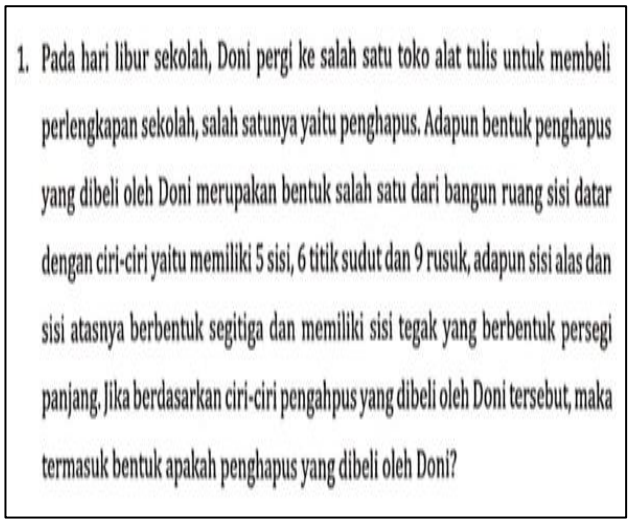
No.	Stages of Mathematical Literacy	Percentage of learners answering correctly (%)				
		Problem 1	**Problem 2**	**Problem 3**	**Problem 4**	**Problem 5**
1.	Understand and formulate situations mathematically by creating a mathematical model of a problem	67	50	67	56	67
2.	Apply mathematical concepts, facts, procedures, objects and reasoning to solve problems	0	50	67	11,1	17

3.	Interpret, use, evaluate, and interpret the results that have been obtained mathematically	0	11,1	11,1	0	0

Based on table 4, it can be seen that in each student's ability to answer correctly for each stage of mathematical literacy varies. From the table it can be seen that students have basically been able to understand and formulate situations mathematically with a mathematical model of a problem, but when solving the problems given, students still have difficulty in applying concepts or procedures in solving. Then the steps to interpret and evaluate the results obtained are also still lacking by students. This can be seen from the data that this step is the step with the lowest percentage of all stages in solving the given mathematical literacy problem. Based on the results of the study, there are several findings from the results of the study indicating that there are errors of students in solving mathematical literacy problems, especially in flat-sided space building material.

The following is a description of the ability of students to answer mathematical literacy test questions on flat-sided space building material.

a. Problem Number 1


1. Pada hari libur sekolah, Doni pergi ke salah satu toko alat tulis untuk membeli perlengkapan sekolah, salah satunya yaitu penghapus. Adapun bentuk penghapus yang dibeli oleh Doni merupakan bentuk salah satu dari bangun ruang sisi datar dengan ciri-ciri yaitu memiliki 5 sisi, 6 titik sudut dan 9 rusuk, adapun sisi alas dan sisi atasnya berbentuk segitiga dan memiliki sisi tegak yang berbentuk persegi panjang. Jika berdasarkan ciri-ciri pengahpus yang dibeli oleh Doni tersebut, maka termasuk bentuk apakah penghapus yang dibeli oleh Doni?

1. On a school holiday, Doni went to a stationery shop to buy school supplies, one of which was an eraser. The eraser purchased by Doni is the shape of one of the flat-sided spaces with the characteristics of having 5 sides, 6 corner points and 9 ribs, while the base and top sides are triangular and have a rectangular side. if based on the characteristics of the eraser purchased by Doni, then what shape is the eraser purchased by Doni?

Figure 1. Problem Number 1

Problem number 1 is related to the flat-sided space of triangular prisms which is presented with problems in everyday life. Based on this problem, students are expected to be able to identify the shape of the eraser based on the characteristics that have been given. The answers of students related to question number 1 are in Figure 2.

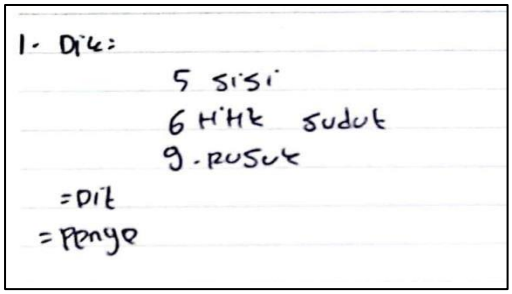
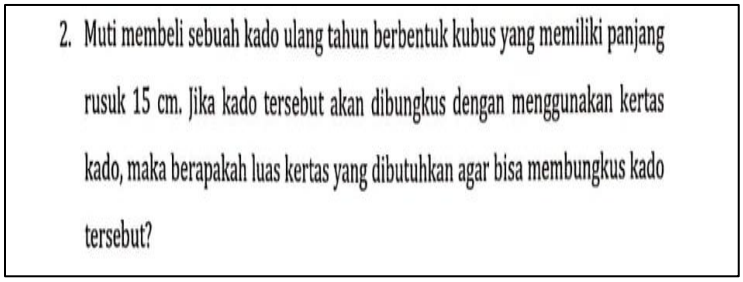


Figure 2. Learners' answers to Problem Number 1

Based on Figure 2, it can be seen that students have not been able to evaluate the problems given. This can be seen from the answers of students who only write some of the information known in the problem. Learners do not conduct in-depth analysis by applying facts and procedures based on the information given in the problem.

b. Problem Number 2



2. Muti bought a birthday gift in the shape of a cube with a rib length of 15 cm. if the gift is wrapped using wrapping paper, then what is the area of paper needed to wrap the gift?

Figure 3. Problem Number 2

Problem number 2 is related to the flat side space of the cube which is presented with problems in everyday life. Based on this problem, students are expected to be able to calculate the surface area of a cube-shaped gift so that the area of paper needed to wrap the gift can be determined. The answers of students related to question number 2 are in Figure 4.

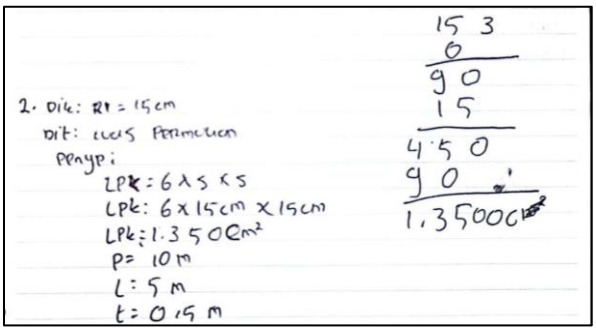
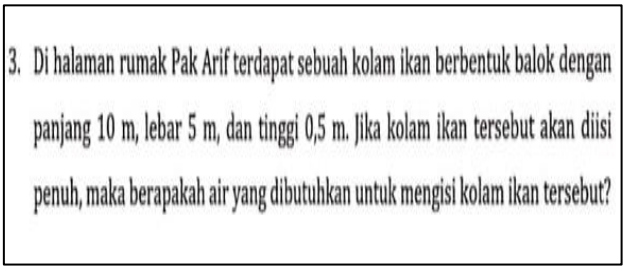


Figure 4. Learners' answers to Problem Number 2

Based on Figure 4, it can be seen that students have been able to formulate problems mathematically and perform calculations according to the facts and procedures that apply. However, students have not been able to interpret and interpret the results that have been obtained as the final solution to the problem. From the answer it can be seen that students have been able to perform calculations in accordance with applicable facts and procedures, but the final solution of the answer cannot be interpreted and interpreted correctly by students.

c. Problem Number 3


3. Di halaman rumak Pak Arif terdapat sebuah kolam ikan berbentuk balok dengan panjang 10 m, lebar 5 m, dan tinggi 0,5 m. Jika kolam ikan tersebut akan diisi penuh, maka berapakah air yang dibutuhkan untuk mengisi kolam ikan tersebut?

3. In the yard of Mr. Arif's house there is a block-shaped fish pond with a length of 10 m, a width of 5 m, and a height of 0.5 m. If the fish pond is to be filled, then how much water is needed to fill the fish pond?

Figure 5. Problem Number 3

Problem number 3 is related to the flat side of the beam which is presented with problems in everyday life. Based on this problem, students are expected to be able to calculate the volume of a block-shaped pool before determining the amount of water needed to fill the pool. The answers of students related to question number 3 are in Figure 6.

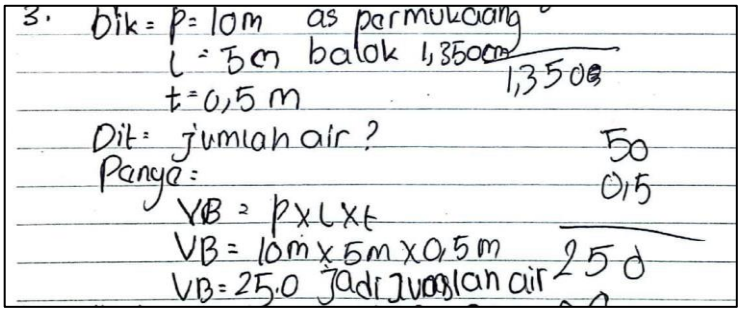
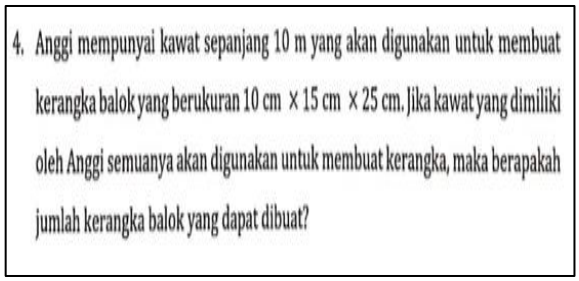


Figure 6. Learners' answers to Problem Number 3

Based on Figure 6, it can be seen that students are able to formulate problems mathematically and perform calculations according to the facts and procedures that apply. However, students have not been able to interpret and interpret correctly the results that have been obtained as the final solution to the problem.

d. Problem Number 4


4. Anggi mempunyai kawat sepanjang 10 m yang akan digunakan untuk membuat kerangka balok yang berukuran 10 cm x 15 cm x 25 cm. Jika kawat yang dimiliki oleh Anggi semuanya akan digunakan untuk membuat kerangka, maka berapakah jumlah kerangka balok yang dapat dibuat?

4. Anggi has 10 m of wire that will be used to make a beam frame that measures 10 cm X 15 cm X 25 cm. If all the wire that Anggi has will be used to make a frame, then how many beam frames can be made?

Figure 7. Problem Number 4

Problem number 4 is related to the flat side of the beam which is presented with problems in everyday life. Based on this problem, students are expected to be able to calculate the number of beam frames that can be made from a wire. The answers of students related to question number 4 are in Figure 8.

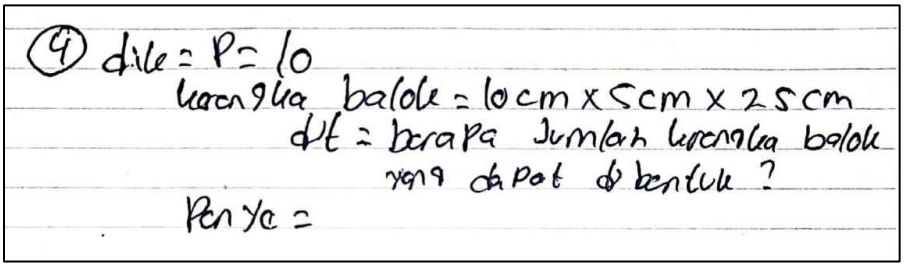


Figure 8. Learners' answers to Problem Number 4

Based on Figure 8, it is evident that the students have not yet developed the ability to effectively evaluate the given problems. This is evident from the limited nature of their responses, as they merely state some of the known information without engaging in a comprehensive analysis. The learners fail to apply relevant facts and procedures based on the provided information, indicating a lack of depth in their problem-solving approach.

e. Problem Number 5

5. "A toy store has an inventory of 180 rubiks with 5 cm ribs. An employee will put the rubiks into a cardboard box with a length of 50 cm, a width of 15 cm, and a height of 10 cm. How many boxes are needed to fit all the rubiks into the box?"

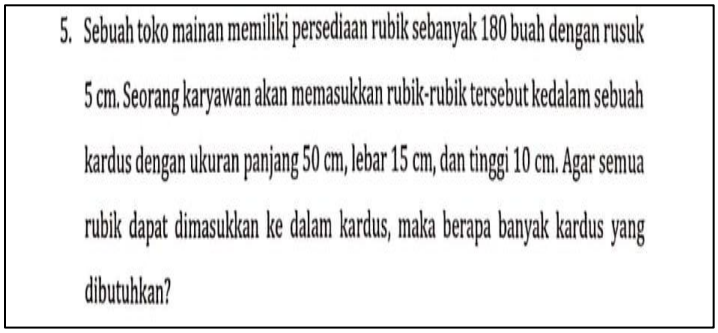

5. Sebuah toko mainan memiliki persediaan rubik sebanyak 180 buah dengan rusuk 5 cm. Seorang karyawan akan memasukkan rubik-rubik tersebut kedalam sebuah kardus dengan ukuran panjang 50 cm, lebar 15 cm, dan tinggi 10 cm. Agar semua rubik dapat dimasukkan ke dalam kardus, maka berapa banyak kardus yang dibutuhkan?

Figure 9. Problem Number 5

Problem number 5 is related to the flat side space of the beam which is presented with problems in everyday life. Based on this problem, students are expected to be able to calculate how many boxes are needed so that all rubiks can fit into the boxes with the size of the boxes listed in the problem.

The answers of students related to question number 5 are in Figure 10.

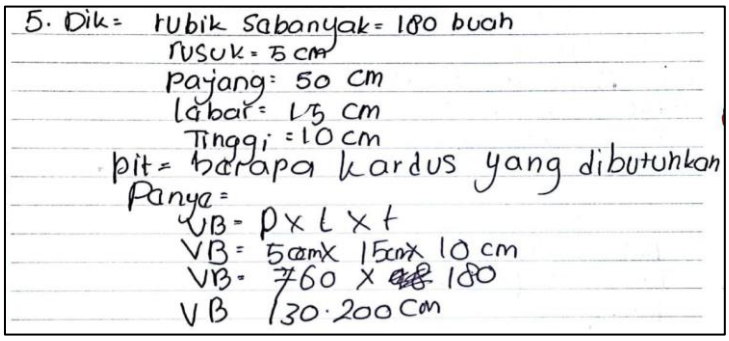


Figure 10. Learners' answers to Problem Number 5

Based on Figure 10, it is found that students are able to understand and formulate information from the given problem. Learners have also been able to apply the right concepts and procedures, but are wrong in computing problem solving. In addition, students have not been able to interpret and interpret the results obtained as the final solution to the problem.

From the description of the ability of students in answering the mathematics literacy test on flat-sided space building material above, it was found that there were still students' mistakes in solving the problems given. This is supported by the results of interviews with students who revealed that they were confused, did not understand, and did not know how to work from the problems that had been given. Furthermore, to clarify the picture of students' learning obstacles, an analysis of learning obstacles is carried out which includes ontological obstacles and epistemological obstacles.

a. Ontogenical Obstacles

The results of the research that have been described previously show that some students have difficulty in understanding the basic concepts related to the properties, surface area, and volume of building a flat side space. This reflects the existence of ontogenic barriers in their understanding of the stages of individual cognitive and psychological development. For example, at certain ontogenic stages, learners may not yet have the mature cognitive ability to visualize three-dimensional objects or understand changes in the shape of geometric objects. These constraints can affect their understanding of concepts and geometric relationships between such objects. When given questions that require them to apply the concepts they have learned, learners feel confused and have difficulty in answering the questions given. For example, when learners are asked to identify flat side space builds based on given properties, they still face difficulties in the process of recognizing the elements that make up the flat side space build, so the advanced problem solving process cannot be done properly.

In this case, the ontogenic barrier or mental readiness of the student plays an important role in the understanding of geometry. It is important for educators to understand the stages of ontogenic development of students and identify cognitive barriers that may arise. By paying attention to students' level of mental readiness, educators can devise appropriate learning strategies to help students overcome these ontogenic barriers. By providing an appropriate approach and providing appropriate support, students can develop a better understanding of geometry concepts and overcome obstacles that arise in the learning process.

b. Epistemological Obstacle

The epistemological obstacles identified in this study relate to learners' difficulties in acquiring mathematical knowledge about geometry concepts and terms. Learners may have difficulty assimilating these concepts, relating them to existing knowledge, or articulating their understanding appropriately. This can affect learners' ability to apply mathematical concepts in the context of Space and Shape. Understanding the properties, concepts of surface area and volume that are not intact causes students to have difficulty in solving problems because students are accustomed to memorizing formulas without knowing the procedure for solving the problem. In addition, students also have difficulty in understanding the relationship between geometry shapes and properties. This is one of the causes of the low ability of students in solving the problems given.

This is in line with the research of Elfiah et al., (2020) which revealed that the epistemological barriers experienced by students include indicators of conceptual barriers, procedural barriers, and operational techniques. Conceptual barriers are found

in indicators of errors in determining formulas, inappropriate use of theorems or definitions, and formulas, theorems, or definitions not written to answer questions. This is because subjects who have not been able to analyze the concept of the problem given and are lazy to write down the formula, theorem or definition. Procedural barriers are found when preparing steps and symbols in answering a problem. This is because students have not been able to recognize the conditions given by a concept. Operational technique barriers are often found in learner errors in writing, causing learner errors in calculations. This obstacle occurs because students are still less careful and thorough in answering a problem. The explanation of the above conclusions also occurs because many students still rely on several examples of problems that have been given by teachers with different types of problems. Students have not been able to develop and create thinking patterns to answer questions, so that students experience epistemological obstacles.

Therefore, based on the results of the research and discussion above, it can be concluded that there are several learning barriers faced by students in understanding mathematical concepts and skills on Space and Shape content. These barriers include difficulties in understanding and formulating situations mathematically by making mathematical models, difficulties in applying mathematical concepts, facts, procedures, objects and reasoning to solve geometry problems, and difficulties in evaluating and interpreting the results obtained. There are several factors that contribute to learning obstacles in students' mathematical literacy skills in Space and Shape content. First, the lack of strong prior understanding or math prerequisites can hinder learners' ability to understand geometry concepts. Second, learners may have difficulty in abstract thinking, especially when it comes to applying mathematical concepts in real-life situations. Third, the lack of understanding of mathematical notations and representations used in the context of geometry can make it difficult for learners to understand and apply the concept. This is in line with research by Farisal et al., (2022) which found that there are obstacles to student learning in solving math problems, such as obstacles to understanding the concept and purpose of the problem. Another study by Rahmawati &; Adiastuty (2023) which found that obstacles that often arise for students in solving problems related to building flat-sided spaces are types of didactic obstacles such as mispresentations that cause misconceptions. In addition, another problem in solving problems that become learning obstacles is that in the questions given there are non-routine problems or different from those usually taught.

Based on the findings of this study, it is recommended that mathematics teachers identify the obstacles faced by learners in learning Space and Shape content. Furthermore, teachers can adopt appropriate learning approaches and strategies to help learners overcome these obstacles. The use of visual aids, simulations, and group discussions can be an effective alternative in improving students' mathematical literacy. As revealed by Tastbita et al., (2020) that the obstacles experienced by students can be overcome by

several things, namely providing a deep understanding of concepts that have not been understood by students, learning is more packaged fun so that students will be interested in learning, or teachers can design an interesting and fun didactic design by paying attention to the learning model used.

The findings of this study have significant implications for designing more effective teaching strategies to overcome ontological obstacles and epistemological obstacles in learning mathematics content, particularly in the area of Space and Shape. Understanding these implications can help educators enhance the learning experience and promote better comprehension among students. The following are some detailed implications that can be considered:

a. Using Visual and Concrete Approaches

In order to facilitate a deeper understanding of geometry concepts, teachers should incorporate visual and concrete approaches in their instruction. This can involve using visual aids such as diagrams, charts, and models to help students visualize geometric shapes and structures. Concrete materials, such as manipulatives or physical objects, can also be used to provide hands-on experiences and enhance spatial reasoning skills.

b. Linking Concepts with Real Contexts

Making connections between geometry concepts and real-life situations is crucial for students to grasp the practical relevance of mathematics. Teachers can achieve this by presenting examples and problems that relate to students' everyday experiences. By demonstrating how geometry is used in architecture, design, or navigation, students can better appreciate the applicability and utility of mathematical concepts.

c. Providing Exercises and Promoting Deep Understanding

To foster a comprehensive understanding of Space and Shape, teachers should provide a variety of exercises that challenge students to think critically and apply their knowledge in different contexts. These exercises should encourage students to explore geometric properties, relationships, and transformations. By promoting deep understanding, students can develop problem-solving skills and apply geometry concepts in diverse scenarios.

d. Encouraging Collaboration and Class Discussion

Creating a collaborative learning environment is essential for addressing obstacles in mathematical learning. Teachers can facilitate group activities, discussions, and peer interactions to encourage students to share their perspectives, exchange ideas, and

collectively solve problems. This collaborative approach fosters active engagement, helps students overcome challenges, and promotes a deeper understanding of geometric concepts through shared knowledge and insights.

e. Providing Positive Reinforcement and Constructive Feedback

Teachers should employ positive reinforcement strategies to motivate students and build their confidence in learning mathematics. Recognizing students' efforts, praising their progress, and providing constructive feedback can inspire a growth mindset and create a supportive learning atmosphere. By acknowledging students' achievements and addressing areas for improvement, teachers can facilitate continuous learning and enhance students' understanding of Space and Shape concepts.

Implementing these implications in teaching is expected to overcome ontological and epistemological obstacles experienced by students in understanding mathematical content in the field of Space and Shape. Effective and focused teaching can help students better develop their math literacy skills and succeed in maths learning.

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