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ANALYSIS LEARNING OBSTACLES OF MATHEMATICAL LITERACY SKILLS OF GRADE VIII STUDENTS ON THE CONTENT OF SPACE AND SHAPE

Andi Kusumayanti[1], Nur Miftahul Jannah[2], Fatmalasari[3], Arninda Wahyuni[4], Siti Qonia Sulaiman[5], & Lisnasari Andi Mattoliang[6]

[1,2,3,4,5,6]Universitas Islam Negeri Alauddin Makassar
Correspondence Email: nurmiftahuljannah33@gmail.com

ABSTRACT

This study aims to obtain an overview of the learning obstacles experienced by students in terms of mathematical literacy skills obtained through the experience of students in solving problems on flat-sided space building material space and shape content. The research method used is the qualitative method. This research involved students of grade VIII of SMPN 2 Sungguminasa and a subject teacher. The analysis of students' mathematical literacy skills and learning obstacles was carried out based on the results of the test instrument of the mathematical literacy competency test on space and shape content, in-depth interviews, and direct observation. The results show that students experience learning obstacles that are ontogenic, didactic, and epistemological in solving flat-sided space problems based on students' mathematical literacy skills. The ontogenic learning obstacle is the lack of basic geometry skills which results in errors in the application of flat-sided space formulas, determining the position of lines. Didactic learning obstacles are incomplete understanding of the concepts obtained where students tend to only use quick formulas so they forget to use the right and easy problem-solving procedures. The epistemological learning obstacle is the lack of understanding of the concept of students who tend to memorize formulas so that when developing problems students cannot solve the given mathematical problems. Based on this, this study obtained an overview of the didactical situation based on the learning obstacles experienced by students based on mathematical literacy skills.

Keywords: Learning obstacles; literacy skills; space and shape content

1. INTRODUCTION

Education is a bridge for everyone to know something they do not know in order to develop themselves and be able to compete both domestically and abroad (Manik et al., 2020). Education is an effort that requires awareness and common sense that is carried out to develop one's potential.

Education in our country provides abstract or non-abstract learning for students which requires learning strategies to improve the quality of students during the learning process (Zhao & Beijing, 2016). One of the subjects presented in school is mathematics. Many perspectives are then the subject of discussion and even debate by experts in defining what mathematics really is, ranging from the meaning of mathematics as a symbol, language of numbers, calculations, abstract science, logical thinking methods and so on (Education et al., n.d.). However, it can be concluded that mathematics is one of the learning topics that requires memory, the speed of a person's determination funds in solving a problem directed into mathematical form.

Based on the 2013 curriculum, where mathematics learning contains flat-sided space topics which are then specialized into cube and beam material. Where the cubes and beams are material included in flat-sided space in the even semester of class VIII SMP. One of the expectations of teaching this material is that students are able to determine the volume of cubes and blocks. In addition, the teaching of cube and beam material is expected so that students can determine concepts in solving existing problems. A space is a shape that has a volume while a flat-sided space is a space that has sides like a flat shape (Safaati et al., 2022; Armiyansyah et al., 2021). So it can be interpreted more simply that the flat-sided space is the shape of the sides like a flat shape but has volume / space.

The success of the application of mathematics education as a subject in schools can be seen based on the extent to which students can solve mathematical problems presented by educators through books or question instruments that have been provided, but it can also be seen through the extent to which students can contribute to applying the implied objectives of learning mathematics in their daily lives. Although at this time based on the results of the School Examination, it has illustrated that students' mathematics learning achievement is still very low. (Amara, 2021; Fane & Sugito, 2019; Lintuman & Wijaya, 2020). Many things can be an aspect of assessment to determine the achievement of mathematics learning or the low learning outcomes of students.

One aspect of assessment related to the low learning outcomes of students is based on their literacy skills. Mathematical literacy is an ability that measures a person in various aspects involving the content, context and process of learning mathematics. PISA assessments from year to year for several previous periods reveal the fact that the

mathematical literacy skills of Indonesian students are still far below the average of other OECD countries. Especially mathematical literacy skills on space and shape content. This is because the process of habituation in mathematics literacy is less accustomed to learning in schools because teachers do not understand the essence of mathematics learning that it is not the ability to count the only determinant but logical and critical thinking is also very important in learning mathematics (Mas'udah et al., 2018; Habibi & Suparman, 2020; Madensi Selan, Farida Daniel, 2020). Which if this is studied further through analyzing the learning situation, it will be known what causes the obstacles that cause students to find it difficult to understand the space and shape material in particular. Which is also later referred to as learning obstacles or known as learning obstacles.

NJCLD (Ministry of Education and Culture, 2020) reveals that mathematics learning difficulties are a situation where a group of abilities that experience difficulties such as difficulties in hearing, speaking, walking and so on as well as in mathematics where this situation does not describe physical or mental defects in every human being, but this difficulty factor occurs in humans when performing a continuous action in finding out something. What becomes some of the learning difficulties of students according to Nursalam (2016: 4) is where students learn without actually knowing what they are learning and what they are learning for. So that learners need habits to understand the initial mathematical concepts that will be learned in the future.

This is in line with the results of pre-observation conducted at SMPN 2 Sungguminasa, where researchers found the fact of learning difficulties that there are still students who are wrong or do not know at all in solving problems on space and shape content because the problems presented are not in an exact form that can be determined directly the solution, but require simple analysis from students through the storyline of the problem presented. In addition, there are also students who have not been able to apply formulas from space and shape content even directly. This problem can occur due to one factor, namely the learning process carried out by educators in the classroom still using the lecture method which ultimately positions the teacher only as a speaker and students as listeners. So that this can ultimately trigger learning difficulties experienced by students. This is similar to research conducted by Hasibuan (2018) with the research title Analysis of students' Mathematics learning difficulties on the subject of flat-sided space building at SMP Negeri 12 Bandung that there are several learning difficulties experienced by students in learning, especially on the subject of flat-sided space building which when given a question instrument in the form of a narrative, students find it difficult to solve the problem because they do not know how to place the core of the problem narrative to the right solution. In the pre-observation activities carried out by researchers, the researchers also gave questions to VIIi class students. The pre-observation results found by researchers were that when students finished working on the math literacy problem, it illustrated that students still had the wrong concept in working on the

problem. The following is the response of one of the students in the pre-observation activities that have been carried out.

(a)

Untuk membuat rak buku seorang pengrajin memerlukan bahan sebagai berikut:

4 buah papan kayu panjang
6 buah papan kayu pendek
12 penjepit kecil
2 penjepit besar
14 buah sekrup

1 buah rak buku

Untuk mendapatkan satu buah rak buku seorang pengrajin memerlukan bahan-bahan diatas. Sedangkan Pengrajin tersebut menyimpan stok 26 papan kayu panjang, 33 papan kayu pendek, 200 penjepit kecil, 20 penjepit besar, dan 510 sekrup.
Coba pikirkan berapa banyak rak buku yang mungkin dapat dibuat oleh pengrajin itu?

(b)

To make a bookshelf a craftsman needs the following materials:

4 pieces of long wooden boards
6 pieces of short wooden boards
12 small clamps
2 big clamps
14 pieces of screws

1 bookcase

To get one bookcase a craftsman needs the above materials. Meanwhile, the craftsman keeps a stock of 26 long wooden boards, 33 short wooden boards, 200 small clamps, 20 large clamps, and 510 screws.
Think about how many bookshelves the craftsman could possibly make?

(c)

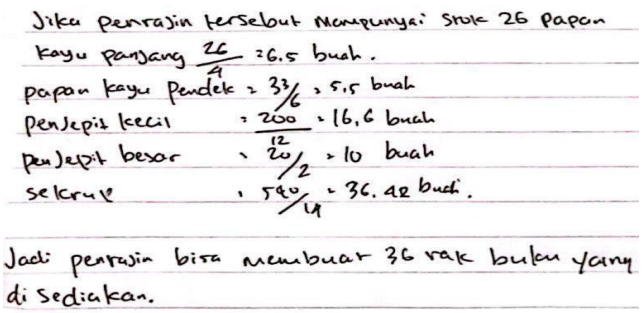

Figure 1. (a) Indonesian version of the question, (b) English version of the question, (c) Respondents' answers

Based on the results of the answer from one of the VIIi class students above, errors and misconceptions of students have been seen. The errors and misconceptions of the students above are seen as the impact of learning difficulties experienced by students. The mistakes of the learners above are due to the lack of analysis of the learners to solve

the problems given. That is because in simple terms the given problem does not require memorization of concepts/formulas, but only analysis of multiplication and division operations, but the problem is presented in the study of space and shape. From the answer, it can be seen that students answer by dividing each length of the board needed by four when it should be enough to multiply it by an integer that is close to the length of the person who has the size of the existing boards. This is very much in line with research also conducted by Safitri & Setyawan (2020) and Nur (2021) with the research title Analysis of Mathematics Learning Difficulties in Class V Spatial Buildings Material SDN Banyuajuh 6 2019/2020 School Year also found that there were several learning difficulties experienced by students. Where flat-sided space building is a topic currently studied in class VIII Junior High School in even semester. That students need to be careful in looking at the pictures and the flow of the problems given to solve the problems given. However, the math topics here specifically include cubes and blocks, which when given problems related to cubes and blocks the formulas used are still often confused between volume and surface area. In addition, based on research conducted by (Setiawati, 2011) with the title Epistemological Obstacles in Madrasah Aliyah Students that learning obstacles experienced by students can come from various aspects/directions so that it is necessary for teachers to pay attention to this in order to anticipate learning obstacles that students may experience.

Based on some of the facts above, researchers are interested in knowing more about the difficulties found in students on the subject of flat-sided spaces, especially in flat-sided spaces in the form of cubes and blocks based on the literacy aspects of space and shape so that it is very important to study more deeply with the aim that students' mathematics learning achievement can be further improved in the future.

2. METHODS

This research is intended to obtain in-depth data about learning obstacles by subjects naturally, so as to obtain an in-depth analysis related to students' learning obstacles to mathematical literacy in flat-sided space building material. Therefore, this research is a type of qualitative research. According to Sugiyono (Albi Anggito, 2018) qualitative research is based on the philosophy of postpositivism, because it is used to research on natural object conditions, (as opposed to experiments) where is the key instrument, sampling of data sources is done purposively and snowball, and collection techniques with triangulation (combined), data analysis is inductive / qualitative, and qualitative research results emphasize meaning rather than generalization.

The subjects of this study were VIII grade students of SMPN 2 Sungguminasa as many as 15 students who were then re-selected 5 students who became subjects with the criteria of students who had difficulties and students who had sufficient mathematical

literacy skills in solving problems. The five learners who were used as subjects were coded "S" as subjects starting from S1 to S5. In addition, the subject teacher is also used as a data source. The data obtained in this study are primary data types. According to Pratiwi (2017) primary data is "data that comes from the original or first source.

The data collection technique used in this research is the triangulation technique. Triangulation is one of the approaches taken in qualitative data processing. As one of the qualitative data processing techniques, according to Sugiyono (Agung Rimba Kurniawan, 2019), triangulation is a technique used in data collection that combines various data collection techniques and data sources that already exist. The use of triangulation is to see the inequality between the data obtained from one informant and another. The types of triangulation used in this research are technical triangulation and source triangulation. Sugiyono (2012) revealed that source triangulation is an activity of obtaining data from different sources with the same technique. The sources referred to in this study are students and teachers using the same data collection technique, namely interviews. Meanwhile, triangulation technique is a data collection technique from different techniques with the aim of obtaining data from the same source. The techniques used in this research are proficiency tests and interviews with students, as well as interviews and analysis of learning observations with teachers.

The instruments used to obtain data are semi-structured interview guidelines, observation guidelines, and tests. According to Sugiyono (2016), semi-structured interviews are interviews where the implementation is freer when compared to structured interviews. The purpose of this interview is to find problems more openly, where the interviewees are asked for their opinions and ideas. The observation guideline is used to find out what will be traced in the school to be observed. While the tests used in this study are in the form of subjective tests or descriptions, namely questions whose answers will require students to organize ideas or things they have learned by expressing these ideas in the form of writing or descriptions of words. The description test in the form of questions is certainly based on mathematical literacy. The indicators of mathematical literacy in the questions on each item are as follows.

Table 1. Literacy Indicator Test Instrument

Math Literacy Indicator	Question Item Number
Able to formulate mathematical problems	1, 2, 3, 4, 5
Able to use concepts, facts, procedures, and reasoning mathematically	4
Interpret, apply, and evaluate the results of a mathematical process	2 and 3

The data analysis technique used is the Miles and Huberman model. The following is an overview of data analysis techniques with the Miles and Huberman model.

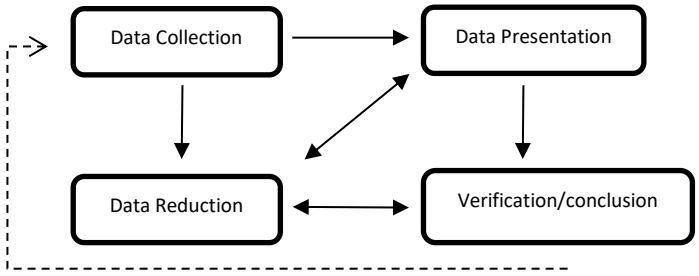

Figure 2. Miles and Huberman Model Data Analysis Technique

According to Miles & Huberman (1992: 16) the analysis consists of three streams of activities that occur simultaneously, namely: data reduction, data presentation, and conclusion drawing/verification. Data reduction is defined as the process of selecting, focusing on simplifying, abstracting, and transforming the rough data that emerges from written notes in the field. Data reduction takes place continuously throughout the qualitative research-oriented project. Miles and Huberman limit the presentation of data as a presentation of a set of information that gives the possibility of drawing conclusions and taking action. Meanwhile, conclusion drawing / verification according to Miles and Huberman is an activity of complete confirmation. Conclusions are verified during the research process. Verification can be in the form of reviewing field notes, brainstorming with peers, or matching data with other sets of data.

3. RESULTS AND DISCUSSION

The following is the data obtained based on test instruments and semi-structured interviews with respondents.

Problem Number 1

Problem number one instructs learners to calculate how many books can fit in a gift box along with a picture of the gift box and the book. Problem number one is intended to see the extent to which students can construct their knowledge about flat-sided space in this case the volume of blocks by collaborating their basic mathematical knowledge, namely multiplication and division. As for the results of data reduction, it is obtained that students with the code S1 have answers that are close to perfect. When viewed from the overall answer of the respondents, most students have been able to answer questions

with the right solution. The shortcomings of the students' answers are in the question prompts to describe the space building. Many learners are less able to distinguish the shapes of cubes and blocks. In addition, students tend to draw spaces according to the reality seen, for example on the answer sheet with the following S1 code.

(a) (b)

1. Mita ingin membuat sebuah kotak kado untuk temannya. Kotak kado tersebut akan diisi dengan buku tulis. Jika Kotaknya berbentuk balok, dengan panjang 45 cm, lebar 15 cm, dan tinggi 25cm. Berapakan maksimal buku yang dapat masuk, jika panjangnya adalah 16cm, lebarya adalah 8cm, dan tingginya adalah 2cm? (Gambarkan bentuk kotak kado dan buku tersebut)	1. Mita wants to make a gift box for her friend. The box will be filled with notebooks. If the box is a block, with length 45 cm, width 15 cm, and height 25cm. What is the maximum number of books that can fit in, if the length is 16cm, the width is 8cm, and the height is 2cm? (Draw the shape of the gift box and the books).

(c)

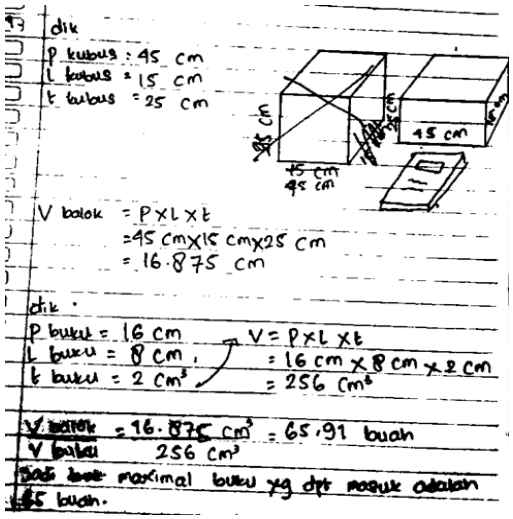

Figure 3. (a) Item Number 1 for Indonesian Version, (b) Item Number 1 for English Version (c) Respondent's Answer (S1)

The picture above can be considered in accordance with the procedure for answering description questions. The results obtained are also correct, but the problem is the students' ability to construct their understanding into a picture. The answer sheet code S1 above, collaborates his knowledge of flat buildings and visible reality. This can be seen

from the book image. As for the results of interviews with respondents code S1 obtained that, S1 only draws according to what he knows about the shape of the book. This indicates that the learner has not been able to collaborate his knowledge of flat-sided spaces with the reality he sees.

Problem Number 2

Problem number two instructs learners to find the length, width and height of a pencil case if the ratio of the three and the surface area of the pencil case are known. This question is intended to see the extent to which learners can analyze the relationship between surface area and the length, width, and height of the beam. As for the results of data reduction, it was found that at least only 3 learners out of 15 learners were able to describe the beam properly. In addition, there are no learners who are able to analyze the question instructions about the length, width, and height to be known. Here is one of the answer sheets from respondents with code S3.

(a)

2. Diketahui kotak pensil Dissa berbentuk balok dengan perbandingan $p:l:t = 4:2:3$. Jika diketahui luas permukaan kotak pensil tersebut $1.300\ cm^2$, hitunglah ukuran panjang, lebar dan tinggi kotak pensil tersebut.(Gambarkan pula bentuk kotak pensil tersebut)

(b)

2. You know Dissa's pencil case is a block with the ratio p:l:t = 4:2:3. If the surface area of the pencil case is 1,300 cm^2, calculate the length, width and height of the pencil case. (Also draw the shape of the pencil case).

(c)

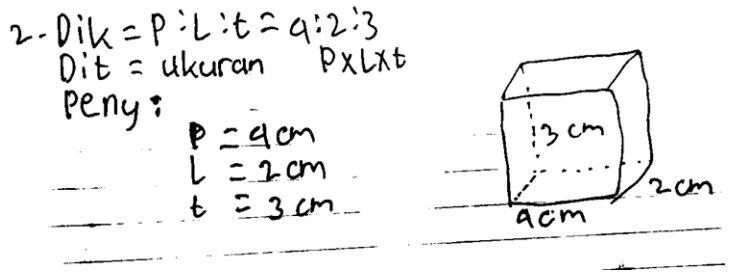

Figure 4. (a) Item Number 2 for Indonesian Version, (b) Item Number 2 for English Version, (c) Respondent's Answer (S3)

The picture above can be assessed as not correct with the question instructions. The question instructs to describe a block but the learners with the code S3 describe a cube. Of course this indicates that students' understanding of basic geometry is still minimal. In addition, S3 also has not written completely the information presented in the problem, it can be seen from the S3 answer sheet that has not included the known surface area of the beam.

Problem Number 3

Problem number three instructs learners to find the number of chicken cages that can be made by knowing the length of the cage ribs and the length of the iron they have. This question is intended to determine the learners' understanding of flat-sided space, namely cubes, how learners analyze the relationship between ribs and cubes, how learners collaborate basic mathematics knowledge with their knowledge of cubes. The results obtained based on data reduction are that there are only 5 people who understand changes in the measurement of cube ribs. As for one of the answer sheets with code S5 of 10 students who have not been able to construct their basic understanding of mathematics with flat-sided spaces as follows.

(a) (b)

3. Pak Khaviar ingin membuat kandang ayam berbentuk kubus dengan kerangka yang terbuat dari besi. Panjang sisi kandang yang direncanakan adalah 40 cm. Jika Pak Khaviar memiliki besi sepanjang 1920 meter, maka berapakah kandang yang bisa dibuat olehnya?	3. Mr. Khaviar wants to build a cube-shaped chicken coop with a frame made of iron. The side length of the planned cage is 40 cm. If Mr. Khaviar has 1920 meters of iron, how many cages can he make?

(c)

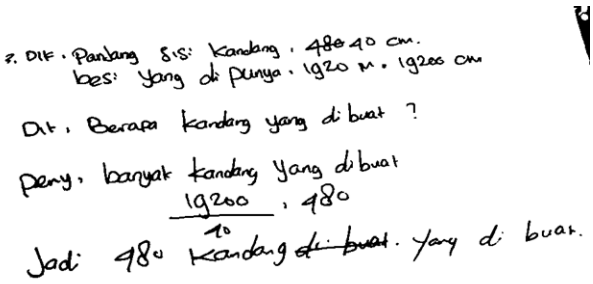

Figure 5. (a) Item Number 3 for Indonesian Version, (b) Item Number 3 for English Version, (c) Respondent's Answer (S5)

The figure above shows that the average learner has not been able to collaborate his initial knowledge of basic geometry and knowledge of measurement. Respondents with code S5 only answered questions with basic math knowledge, namely by dividing numbers with large numbers with small numbers. The understanding of basic mathematical material for students with code S5 is very low, which is the prerequisite material for understanding flat-sided spaces.

Problem Number 4

Problem number four instructs learners to find the volume of the two cubes if only one box has known rib lengths and the other is only known to be 3 cm longer than the first box. This question is intended to see the extent of students' mathematical literacy skills to analyze the lengths of the cube ribs so that they know the volume of both. The results obtained from the results of data reduction are that 7 respondents have been able to answer correctly according to the question instructions. As for the other 6 people, they have not been able to analyze the question sentence which instructs that the first cube is 3 cm longer than the second cube. The following is the answer sheet of students with code S2 who have not been able to answer the question correctly according to the question instructions.

(a) (b)

4. Andi membeli dua buah kotak berbentuk kubus dengan ukuran yang berbeda untuk menyimpan buku-buku lamanya. Jika panjang rusuk kotak pertama 3 cm lebih panjang dari pada rusuk kotak kedua dan panjang rusuk kotak kedua adalah 20 cm. Hitunglah volume kedua kotak yang dibeli oleh Andi	4. Andi bought two cube-shaped boxes of different sizes to store his old books. If the length of the rib of the first box is 3 cm longer than the rib of the second box and the length of the rib of the second box is 20 cm. Calculate the volume of the two boxes bought by Andi

(c)

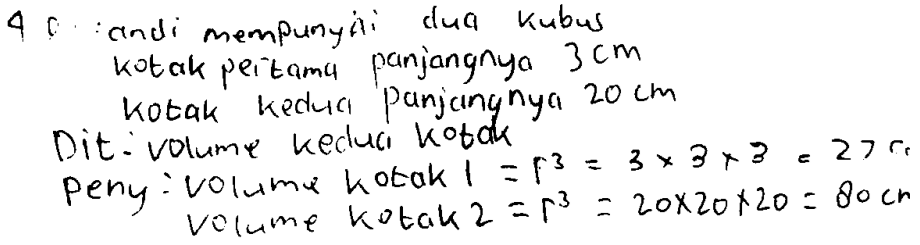

Figure 6. (a) Item Number 4 for Indonesian Version, (b) Item Number 4 for English Version, (c) Respondents' Answers (S2)

Based on the picture above, it is obtained that the ability to analyze based on the results of students' mathematical literacy is still lacking. This can be seen from the answer sheet code S2 which directly enters the numbers in the problem into the volume formula. Of course this indicates a learning obstacle experienced by students.

Problem Number 5

Problem number five instructs learners to find the volume of a trapezoidal prism. Problem number five is intended to see the extent of learners' knowledge about the volume of flat-sided space buildings, whether learners can collaborate their knowledge of space and flat buildings. As based on the results of data reduction, it was found that there were no learners who were able to answer correctly question number five. Learners tend to only know blocks and cubes for flat-sided space building material. Learners have not been able to construct their knowledge about flat and spatial shapes. The answer sheet with code S4 is as follows.

(a) b)

5. Miss Rika memiliki sebuah kolam renang dirumahnya yang berbentuk trapesium sama kaki dengan ukuran panjang dua sisi sejajarnya secara berturut-turut adalah 2 m dan 4 m, dan jarak keduanya 1 m. Jika kedalaman kolam renang Miss Rika adalah 1,5 m, maka berapakah volume air yang bisa ditampung di kolam renang tersebut?	5. Miss Rika has a swimming pool in her house that is in the shape of an isosceles trapezoid with the lengths of its two parallel sides being 2 m and 4 m, respectively, and the distance between them being 1m. If the depth of Miss Rika's swimming pool is 1.5 m, then what is the volume of water that can be accommodated in the swimming pool?

(c)

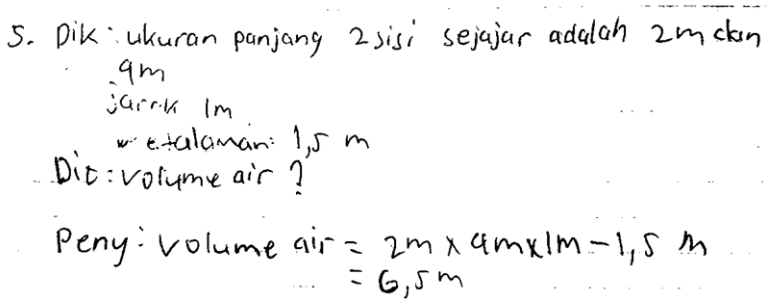

Figure 7. (a) Item Number 5 for Indonesian Version, (b) Item Number 5 for English Version, (c) Respondent's Answer (S4)

The picture above shows that respondents with code S4 do not know about the correlation of flat and spatial shapes. As for the results of the interview, it was found that students with code S4 did not understand the prerequisite material related to flat shapes. This certainly indicates the existence of learning obstacles experienced by students.

Based on the explanation above, the research results can be obtained. The results of this study are the answers to the problems raised by the researcher. Researchers after observing the learning process of flat-sided space-building material that took place by mathematics teachers at SMPN 2 Sungguminasa found that the learning process was less effective due to the time given for one subject. Another difficulty is the initial knowledge of students about flat-sided spaces that are still very lacking, and the teacher's ability to convey information about flat-sided space building material in detail is also lacking.

Brousseau stated that learners naturally experience situations called learning obstacles with contributing factors: Onotgenic barriers, didactic situations, and epistemology.

1. Ontogenic Barriers

Ontogenic obstacles or Ontogeny obstacle is one type of obstacle related to mental readiness to learn as a result of restrictions on learning concepts provided by educators to students (Indrawati et al., 2021). So that if analyzed simply means that this ontogenic obstacle is very necessary to be needed by educators during the learning process to anticipate the impact of this obstacle experienced by students.

Ontogeny obstacles to learners' learning that occur due to learners' cognitive abilities or the knowledge that learners learn. Related ontogeny obstacles are classified into three. First, psychological ontogeny obstacle is the condition of learners who show a lack of motivation, and unpreparedness regarding interest in the material being studied. Second, instrumental ontogeny obstacle is the unpreparedness of students to learn in technical terms regarding teaching materials as indicated by the response to the students' completion process. Third, conceptual ontogeny obstacle is a situation of unpreparedness of students regarding previous learning experiences such as lack of understanding of the concepts of prerequisite material. Below the researchers narrowed down the findings that occurred in the ontogeny obstacle, namely as follows.

Table 2: Ontogenic Obstacle for Learners

Type of Learning Obstacle	Findings
psychologiczny Ontogeny obstacle	➢ Lack of interest of students in learning mathematics because the perception embedded in the minds of students is that math is a difficult science

Instrumentaly Ontogeny obstacle	➢ Learners cannot solve flat-sided space building problems due to low learning motivation ➢ There are still many students who cannot recognize the elements of building space ➢ The average learner does not remember the difference between surface area and volume in solving problems
Ontogeny obstacle konseptual	➢ Learners cannot draw flat-sided spaces because their understanding of flat-sided shapes is still lacking ➢ Learners cannot perform multiplication and division operations

Based on the results of observations and interviews with students, it was found that students were not ready to receive material about flat-sided spaces. This can be seen from the mental readiness of students at the beginning of learning. The mental readiness of students in learning greatly influences the creation of achieving learning goals. Without mental readiness in learning, students will only receive less than optimal learning. Learners must master the initial material thoroughly and various supporting activities must also be organized in the classroom so that students can construct their knowledge with activities created by the teacher into new knowledge. In order for these activities to run smoothly, good mental readiness for learning is needed.

An overview of the mental readiness of students to learn based on observations made by researchers, several things can be described. Before carrying out learning activities, students are in a fresh or fresh condition to learn. Apart from the conditions that appear to students, researchers also see the mental state of students by looking at the readiness of students to receive teaching materials. In the opening activity, the teacher immediately explained the material about flat-sided space, but the learners had not listened well to the material explained. This can be seen from students who have not prepared school equipment and are still doing other activities such as chatting with peers or still using gadgets.

Another fact obtained by researchers is that there are students who do not bring writing utensils, so they borrow from friends. This shows the lack of readiness of students to receive learning. In the core activities, some students when given questions by the teacher still stammered in the sense that students had not been able to construct their knowledge with the teacher's previous explanation. This causes many students to look for problem-solving on gadgets or ask their friends who have finished. So that this can disrupt the learning process.

Furthermore, the instrumental ontogenic obstacles experienced by students can be seen from the process of completing the description test given by the researcher. This can be seen from the completion of the problems done by students.

2. Didactic Situation

The didactic situation or also referred to as didactic obstacles is an obstacle as a result of educators' mistakes in choosing and using and delivering teaching materials used during the learning process (Miftah et al., 2019). So that related teaching materials that will be used in the future require accuracy and the suitability of the material that educators will convey to students really needs to be considered. The division of this didactic situation is as follows.

a. Action situation

In this situation, the teacher is the main subject in learning. The teacher as a provider of information about the material makes it an important role in the learning process. Teachers are required to provide a stimulus to stimulate students to think about the material to be discussed. One of them is by giving examples of problems related to the material.

As for the observation, the researcher found that the action situation given by the teacher to students at the beginning of learning was not sufficient to create a didactical situation. This can be seen from the response given by students to the stimulus given by the teacher. Mathematics teachers at SMPN 2 Sungguminasa, especially class VIII, entered the core learning activities without giving examples of problems related to the material, the teacher immediately gave explanations related to the material. In addition, in this action situation the teacher also pays less attention to the students' response to what he explains. The teacher assumes that the explanation of flat-sided space building material is easily understood by students. So that it continues to continue the explanation without paying attention to the response of students. Furthermore, at the core stage of learning, namely explaining the material, the teacher is less able to explain the material in detail. The researcher assumes that the teacher does not know the initial ability of the students so that the teacher assumes that the students already have prior knowledge about the flat-sided space material.

As for the results of interviews with 5 (five) students, researchers found that the initial knowledge of students on the material was minimal. Learners are not able to distinguish which are flat and spatial shapes, and which are flat-sided spaces and curved-sided spaces.

Based on the explanation above, in this action situation the teacher should provide problems related to the material so as to know the initial knowledge of students. By knowing the initial knowledge of students, the teacher as the main subject in learning can maximize learning by explaining the material of flat-sided spaces in detail starting from their classification to the volume and surface area of flat-sided spaces. Of course, by

providing initial problems as an initial stimulus for students so that their memory tries to recall material about flat-sided spaces that have been studied at the previous level.

In simple terms, the action situation that is expected to occur is as shown below,

Figure 8: Situation at the action stage

From Figure 8 explains that the action situation that must occur in the learning process is the feedback from students on the situation created by the teacher and vice versa, thus triggering the action taken by students on the information provided in the learning process.

b. Formulation situation

In this situation, the teacher becomes a facilitator to help learners solve the problems in the problem. Teachers must be able to create lively learning between learners who solve problems, learners who listen, and the learning situation that is created.

Based on the observation, the researcher found that students could not solve the problem in their own way, this can be seen from the absence of feedback given by students in class VIII SMPN 2 Sungguminasa to the situation created by the math teacher. In addition, some students still look for answers in books and on the internet. However, because there was no feedback given by students, the teacher explained again related to the example given so that there were already some students who dared to try to answer the questions given by the teacher. However, what was seen was that students still stuttered to answer questions that were the same form as the questions given, so the teacher still helped the students to answer the questions. This indicates that learners do not understand the concept of flat-sided spaces so it is difficult to construct existing knowledge to answer questions correctly in their own way.

As for the results of the interview, out of 5 students there are only two students who understand the types of flat side spaces, and there is only 1 person who knows the formula for flat side spaces of cubes and beams which is the problem given by the teacher.

Based on the explanation above, in this situation learners should develop their own concepts that are understood so as to form new strategies or ways of solving problems given by the teacher. The interaction between students and the situation created by the teacher (other students, the context of the problem, and the teacher) should be created to make some initial strategies. However, in reality this did not happen according to the explanation that the researcher explained.

In simple terms, the formulation situation that is expected to occur is as shown below.

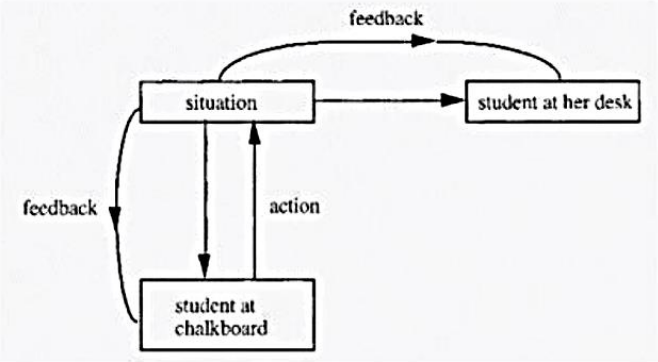

Figure 9: Situation at the formulation stage

Figure 9 explains that the formulation situation that must occur in learning is the feedback between learners and the situation created by the teacher so that there are activities that occur in the feedback that occurs. The formulation situation is to provide opportunities for learners to create their own models, implicitly to express strategies in words that can be understood by learners, discuss, and argue that make other learners accept the explanation. Two-way communication between learners leads them to a strategy.

c. Validation Situation

In this situation the teacher guides learners to the didactic situation through a process to ensure that they use the right method or strategy. The teacher will influence learners by providing explanations for the correct problem solving about theoretical explanations or other meanings of the strategies that have been used in solving the given problem.

Due to the short time allocation, there is no validation situation by the teacher to students. Teachers do not validate the method or strategy found by students whether it is correct or not. This was obtained by researchers from the situation that the teacher built in giving problems to students, where the teacher immediately gave a re-explanation to students related to the problems given with the right solution. Again, in this validation situation, the didactical situation was disrupted by the lack of time allocation and the demands of completing the learning on time.

d. Institutional Situation

Institutionalization is a process that allows learners to construct their initial knowledge into a new knowledge through reinforcement by teachers who give them the value of truth and allow them to use the new knowledge gained to solve problems (EMIA). In this situation the teacher is expected to explain the concept precisely and correctly. After providing an explanation of the concept and examples, the teacher is expected to provide development examples so that students can construct their initial understanding into a new understanding so that they can solve problems from the development examples given by the teacher.

Based on observations, researchers found that teachers have not been able to provide explanations appropriately and correctly. This causes the initial foundation of students' understanding of flat-sided space building material to not be strong, so that students cannot construct their understanding into a new understanding. As for the formulation situation, students are not able to develop their own knowledge to solve a problem or problem given so that a re-explanation is needed by the teacher regarding the problem.

From the explanation of the situation that has been described, the researcher concludes that the learning process has not created a didactical situation. This is in accordance with the discussion of the didactical situation created in the learning process. The ability of the teacher, the activeness of students, and the relationship between teachers and students become the main foundation of learning with didactical situations.

3. Epistemological barriers (Learners' knowledge that has limited application contexts)

Epistemological obstacles or barriers are related to didactic barriers and ontogenic barriers. Hercovics (1989) explains that the scientific development of an individual experiences many problems, in which students' conceptual understanding experiences cognitive constraints. Mathematics learning about flat-sided spaces cannot be carried out optimally due to time constraints. From the learning activities carried out there are several epistemological obstacles obtained by researchers, namely

a. Learners are less able to capture the material explained by the teacher. So that when given examples students are unable to answer correctly.
b. Learners are less able to make strategies or ways of solving problems with the right procedures.
c. Learners are not able to answer questions if they are developed from examples explained by the teacher. They tried repeatedly to solve the development problem by looking for references such as through the internet.
d. The limited time in learning causes teachers to be unable to explain the material in detail to students which of course results in students' understanding which is not thorough.

Based on the results and discussion above, it is found that students experience learning obstacles that are ontogenic, didactic, and epistemological in solving flat-sided space building problems based on students' mathematical literacy skills. ontogenic learning obstacles are the lack of basic geometry skills and square root calculation operations which result in errors in the application of flat-sided space building formulas, determining line positions, and solving square root operations. Didactic learning obstacle is the incomplete understanding of the concepts obtained where students tend to only use quick formulas so they forget to use the right and easy problem-solving procedures. The epistemological learning obstacle is the lack of understanding of the concept of students who tend to memorize formulas so that when developing problems, students cannot solve the mathematical problems given.

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