

Didactic Design for Overcoming Learning Obstacles in Mathematics of Junior High School Students

Lisa Astriani¹, Abdul Mujib², Firmansyah³

^{1,2,3}Mathematics Education Study Program, Universitas Muslim Nusantara Al Washliyah Medan, Indonesia

Correspondent: lisaastriani24@gmail.com

Article history: received May 01, 2022; revised June 12, 2022; accepted June 27, 2022

This article is licensed under a [Creative Commons Attribution-ShareAlike 4.0 International License](https://creativecommons.org/licenses/by-sa/4.0/)



Abstract: This study aims to formulate an alternative design for learning the concept of flat-sided wake-up space against the background of didactic situations and learning obstacles experienced by students. This type of research is a DDR (Didactical Design Research) research. The didactic design was developed through three stages, namely: first, compiling an initial design based on student barriers that had previously been identified, secondly analyzing metapedadidactics carried out during learning, and thirdly, retrospective analysis carried out by identifying learning obstacles and compiling learning designs. This research was conducted at Mts Al Washliyah Tanjung Morawa class VIII with 35 students. The results of this study indicate that there are several learning obstacles that occur to students, namely errors in the concept of flat side space, errors in multiplication, and also errors in answering questions whose context is different from the example questions given. Based on the identification results that have been analyzed, one of the alternative solutions is to develop alternative solutions to the concept of flat side space in order to minimize barriers to learning.

Keywords: Learning Obstacles, Build Flat Side Space

I. INTRODUCTION

Mathematics is one of the sciences studied at every level of education, which is related to other sciences. Mathematics also consists of concepts where the concepts are related to one another. Concepts are basically abstract ideas which are the basis for developing knowledge in the form of data that have definitions (Astuti, 2017). Mathematics is also a science that deals with abstract forms or structures. To be able to understand the structure and relationships required an understanding of the concepts contained in learning mathematics. The need for learning mathematics is stated by Cockroft (Muawanah, 2019) that mathematics needs to be taught to students because (1) it is always used in terms of life; (2) all fields of study require appropriate mathematical skills; (3) is a means of strong, concise and clear communication; (4) can be used to present information in a variety of ways; (5) improve the ability to think logically and thoroughness; and (6) give satisfaction to the effort to solve the opposing problem.

From this quote, it is said that mathematics plays a very important role in education, it is hoped that students can develop the ability to think, reason, remember cultural awareness that allows a person to improve the quality of his life and be able to find solutions to problems faced everyday. But in reality the world of mathematics education is faced with the problem of the low mastery of students at every level of education in mathematics. This is evidenced by the research conducted by (Soviawati, 2011) which concluded that students lacked understanding of mathematical concepts, and students had difficulty applying mathematics in everyday life. Another factor that must be considered in the process of learning mathematics is that the stage of development of students' thinking not yet formal or still concrete, while one of the characteristics of mathematics has an abstract object. This abstract nature causes that students have difficulty in mathematics.

The difficulties faced by students in learning are actually not the result of the students themselves, but can be sourced from the way the teacher presents the material or teaching materials used when learning occurs. (Nuraini, NLS, Suhartono, S., & Yuniawatika, 2017). In addition, there are other factors that can cause learning difficulties which are stated by Shah (Nurhamsiah, N., Halini, H., 2016) namely internal factors and external factors. Internal factors are things or circumstances that arise from within the student himself, while external factors are things or circumstances that come from outside the student. If these factors are not met, then students will experience obstacles in mastering the subject matter.

Barriers to students in learning mathematics affect the mastery of the material to be studied further, this is evidenced by the research conducted by (Sugiarti, 2018). (Sugiarti, 2018) states that the difficulty of students in learning

mathematics will make these students hampered in understanding mathematics and have an impact on mastery of the material to be studied further. Judging from the diversity of mathematics subject matter, that one subject is related to one or more other subjects. This means that the difficulty of students learning one part of mathematics can have an impact on the difficulty of students in learning other parts of mathematics, this confirms that difficulty is the cause of errors. This is also in line with what was conveyed by Novferma(Sugiarti, 2018)that the success of students who are less than optimal in achieving learning outcomes may be because there are learning barriers in students. Therefore, student success also affects the teacher's ability to plan and create optimal learning, besides that the teacher must be able to anticipate the possibility of learning barriers to emerge.

Learning barriers experienced by students because they find it difficult to understand mathematics. This difficulty was encountered from students at the elementary education level and even in tertiary institutions, such as students at Mts Al Washliyah Tanjung Morawa, it was seen that there were still many students who found it difficult to do math problems. Many of them argue that there are certain materials in mathematics that are difficult to understand and cannot be asked directly to the teacher.

According to (Suryadi, 2019) the teacher's role is only to create an initial learning situation that supports interaction between students. This gives rise to meaningful learning in the learning process. The importance of repetition before students learn the concept also makes learning more meaningful. In order for this process to encourage a more optimal learning situation, a maximum effort must be made before learning. This effort is known as Didactic and Pedagogical Anticipation (ADP). ADP is essentially a synthesis of the teacher's thoughts based on various possibilities that are predicted to occur in learning events (Suryadi, 2013).

Based on the results of interviews with mathematics teachers for class VIII, most of them complained about understanding and solving problems such as one of them in the flat-sided wake-up material.

Based on the following description, it is necessary to carry out an analysis to find out the learning obstacles of MTs students so that they can be taken into consideration in the improvement of further learning. The achievement results experienced by students can increase, if learning is structured taking into account the obstacles experienced by students. This research is expected to be a reference for teachers in making teaching materials or designing teaching material designs by considering the learning obstacles found so that they do not happen again in the next lesson.

Therefore, researchers are interested in conducting research on student learning barriers with the title "Didactic Design To Overcome Learning Obstacles for Middle School Students in Junior High School Mathematics". and how are the recommended learning designs to overcome learning obstacles that occur in MTs students in studying the flat side of class VIII and the purpose of this study is to find out the didactic situation during learning, identify learning obstacles that occur to students and develop learning designs to overcome learning obstacles that occur happened to the students of MTs in studying the shape of the flat side of class VIII.

II. METHOD

The research method used in this study is a qualitative research method in the form of didactical design research. Didactical Design Research is a systematic study of designing, developing and evaluating educational interventions that emphasize the didactic aspect of learning design that refers to a more micro learning theory. According to (Suryadi, 2011) DDR thinks comprehensively about what is presented, how students might respond, and how to anticipate it. This thinking process is carried out in 3 (three) phases of learning, namely before learning, during learning, and after learning. The teacher's thinking process in these three phases and the results of the analysis have the potential to produce innovative didactic designs. the researcher analyzed and recorded the findings and recorded the learning process during the observation. and (3) retrospective analysis, namely an analysis that links the results of the hypothetical didactic situation analysis with the results of the metapedadidactic analysis and conduct further interviews on research subjects (students) and teachers(Suryadi 2011). From these three stages, an empirical didactic design will be obtained which will continue to be refined through the three stages of DDR.

The participants in this study were class VIII students of Mts Al Wasliyah Tanjung Morawa, semester II of the 2021/2022 academic year. The author chose these participants because there were learning obstacles in the flat-sided building material experienced by 5 students, so the author could analyze what types of obstacles the students experienced. Data collection techniques in this study were carried out by means of observation, tests and interviews. Observations were made directly during the implementation of the didactic design. The instrument used is in the form of a metapedadidactic observation sheet in which it describes several student responses to learning. Written test to collect data or information about the steps taken by students in solving problems related to the shape of the flat side space. The questions given were 7 questions, namely about the material for building flat sides for class VIII Mts. Before the test is given to students, the test is first conducted on a trial run to students who have studied the material on the flat side and given it directly, the aim is to find out the validity, reliability, level of difficulty and distinguishing power of the questions. Interviews were conducted with the aim of digging deeper information from the respondents because it was seen that the results of the answers to questions did not represent the obstacles experienced by students. So from the results of the interviews, it is hoped that researchers can identify learning obstacles in solving the problems of building a flat side that have been given,

as well as documentation studies that are used as witnesses of certain events or as a form of accountability. The document study is focused on the concept and context of the flat side space.

III. RESULT AND DISCUSSIONS

The research was carried out at Mts Al Washliyah Tanjung Morawa in class VIII of the 2021/2022 academic year on May 17 to May 25, 2022 on the material of Constructing Flat Sided Space. There were 35 students who took the test, the test was carried out for 45 minutes.

From the results of the analysis based on didactic situations, the identification of learning obstacles is obtained that the teacher seems to only focus on books and does not really think about the needs of students which are sometimes different from those presented in the book. In addition, the teacher does not really follow the lesson plan because sometimes the conditions in the class are difficult to conditioned, it can be seen that the lesson plans made by the teacher are only limited to handbook documents that are rarely applied during the learning process. In addition, in the learning process the teacher does not waste activities that facilitate students to understand the concept of the material well, such as learning media, for example, with that it can make it easier for students to understand the concepts of the material given and almost half of the students in the class are less enthusiastic in learning even though the teacher has made efforts so that this does not happen during learning. This is what makes students experience learning barriers when studying the material for building flat sides. These obstacles occur due to mastering concepts in students, a less conducive learning atmosphere, and also students' experience of certain contexts is still lacking because the teacher only gives ordinary examples, so that when students are given story questions related to build flat side rooms some students have difficulty in working on the problem.

a. Learning Obstacles S7 students

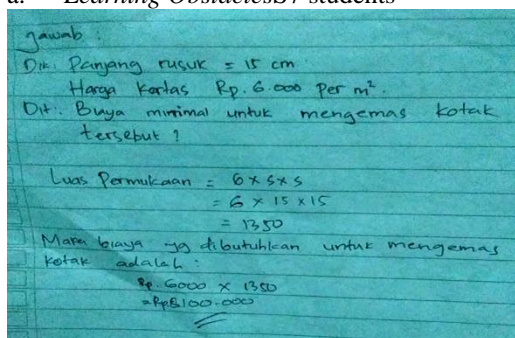


Figure 4.2 Student Answer Results S7

From the results of the students' answers s7, it can be seen from the students' answers that they are not correct. Students are less careful in the process because it looks like the student did not change first from cm to meter, while the expected answer is that after the student is able to change from cm to meter then the student can multiply by the price per meter and get the result of the total asked on the question. From these errors, the researcher concluded that students experienced didactic barriers due to errors in the concept of workmanship made by students in answering these questions, for that students are expected to be more careful and understand the meaning of the questions first, there will be no errors in the processing process later.

- P : Younger brother, what do you think?
is your answer correct?
S : already bro
P : try asking bro (while
give the unit ladder) Do you remember the unit ladder?
S :students look confused
P : Well, on that question right?
who asked the price of paper
per meter right, while the
known in the matter
still in cm
S : yes you
P : then from m to cm multiplied or
share ya dk
S : share sis
P : well that's right, it should be the result

*from the answer of the first sister
first changed from xm to meter
after that just get the results
correct*

b. *Learning Obstacles*S5 students

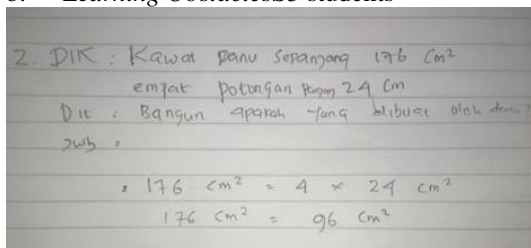


Figure 4.2 Results of S5 Students' Answers

From the results of the s5 students' answers, it can be seen that students do not understand the meaning of the question. Students are only able to write down what is known and also what is asked, but at the time of completion it appears that students have not been able to link between concepts with other concepts. This may be because students still don't really understand the concept of building up space well or students are still confused about the meaning of the problem so they can't know which formula to use in solving the problem. The following are the results of interviews with S5 students who have difficulty in solving question number 2:

- P : Brother, can you read it again
because carefully*
*S : ok sis (while reading the question
number 2)*
*P : According to you, what is the answer
brother is correct or not?*
S : hmmm, I don't know sis
*P : how come you don't know?
(it looks like students are confused in
answer and understand the question)*
*S : I don't know the answer
cymbals*

From these residual errors, the researcher assumed that students experienced didactic barriers because students still could not understand the concept well. This can happen because maybe students feel that in conveying or explaining the concept of building space it is still not correct so that there are still students who do not understand well or indeed students who do not really know about the meaning of the problem so that in solving it it appears that students are still original. in answering it.

Discussion

Before carrying out learning. Of course, the teacher must really have prepared teaching materials that will be used during learning. Both from handbooks, other reference books, learning videos or teaching aids, lesson plans and also exercises that will be given by students when they finish explaining the material. It is these teaching materials that can assist teachers in explaining the material properly and in accordance with the steps that have been prepared into the learning implementation plan and make it easier for students to capture and understand the material that will be delivered by the teacher.

The following is the design of teaching materials that have been made by researchers based on the repersonalization of the identification of learning obstacles that have been found and also based on observations during the study. The design of this teaching material is based on the learning obstacles that have been identified and will later be validated by mathematics teachers, media expert lecturers and also linguistic lecturers and then tested again for class VIII students to see student responses regarding the design of teaching materials that have been designed so that the design this can be better and the design of this teaching material can later be better in the hope that it can also be a reference for all in overcoming learning obstacles in the material, especially building flat side spaces. According to (Dongoran, 2017), in theory there are three strategies that must be prepared by the teacher in carrying out learning, namely:

1. Beginner stages (pre-instructional) include asking students' attendance, asking where the previous discussion was and repeating lessons that have not been mastered by students.
2. The teaching (instructional) stages include core stages such as explaining the learning objectives, discussing the material and concluding the results of the discussion of the material.
3. Follow-up assessment stages.

IV. CONCLUSION

Learning Obstacles which was detected was because there were still students who still experienced conceptual errors in solving questions regarding the shape of the flat side space, besides that there were still students who had not been able to solve the problem slightly different from the example questions given by the teacher including story questions.

From the analysis of the didactic situation and the identification of learning obstacles, the researchers designed alternative designs with the hope that the mistakes made would not be repeated and could minimize obstacles in learning. The didactic design that is made needs to be validated first and then tested on the students to find out the student's response to the design that has been tested.

REFERENCES

- Astuti, R. (2017). Analysis of Learning Obstacles Students in studying Combinatorial material. *JOURNAL OF E-DuMath*, 3(1).
- Muawanah, SM (2019). Analysis of Algebra Learning Difficulties in Class VII Students of SMP Muhammadiyah 4 Kebomas. In (Doctoral dissertation, University of Muhammadiyah Gresik).
- Suryadi, D. (2019) Monograph 2 Didactic Design Research. Bandung: Gapura Press. h (DDR)
- Nuraini, NLS, Suhartono, S., & Yuniawatika, Y. (2017). Student Errors in Operations of Addition and Subtraction of Fractions in Class VI Elementary School. *Elementary School: A Study of Educational Theory and Practice*, 25(2), 168–175).
- Nurwani. (2017). Development of Algebraic Teaching Materials in Middle School Mathematics Learning. In Thesis. Raden Intan State Islamic University.
- Sugiarti, L. (2018, February). Students' difficulties in solving algebraic operations problems. In Proceedings of the National Seminar on Ethnomatnesia Mathematics Education.
- Soviawati, E. (2011). Realistic mathematics approach (PMR) to improve students' thinking skills at the elementary school level. *Special Edition Journal*, 2(2), 79-85.