

ANALYSIS OF STUDENTS' CONCEPT UNDERSTANDING CAPABILITY USING PROSPEROUS EQUIPMENT IN 30 STATE JUNIOR HIGH SCHOOLS, TEBO DISTRICT

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ABSTRACT

The purpose of this study was to analyze the ability to understand students' mathematical concepts in determining the surface area of a flat side shape of cubes and blocks with the help of teaching aids. This research method uses qualitative methods with a descriptive approach. This study describes students' ability to understand mathematical concepts with the help of visual aids. The subjects of this study were 6 class VIII A students at SMP Negeri 30 Tebo District. The instruments used were written tests and interview guidelines. Based on the results of the study, it was shown that the ability to understand students' mathematical concepts in the matter of surface area of blocks and cubes with the help of visual aids in class VIII A of SMP Negeri 30 Tebo Regency was generally in the medium category with the average result showing that students obtained a score of 75.5. Subjects S1 and S2 can only achieve one indicator of the three indicators of students' ability to understand mathematical concepts given. Subjects S9 and S11 could only achieve two indicators of the three indicators of students' ability to understand mathematical concepts given. While subjects S31 and S32 were able to achieve all three indicators of ability to understand mathematical concepts from the three indicators of students' ability to understand mathematical concepts given that they were able to restate concepts, classify objects according to certain characteristics and apply concepts algorithmically.

INTRODUCTION

Mathematics is a structured subject and the material is interconnected, so that when studying material you need to understand the previous material or prerequisite material. Therefore, students must be

able to understand each subsequent material correctly. Understanding concepts is an ability to master learning material which is not only limited to recognizing or knowing, but also the ability to re-express learning material.

that has been studied using simple language and being able to apply it. Mathematics lessons focus on concepts. This means that students must be able to understand the concept of the material in order to solve the problems given.

Understanding concepts is a very important foundation because mastering concepts will make it easier for students to learn mathematics. In studying mathematics students must first understand mathematical concepts so they can solve problems and apply this learning in the real world (Nuraziz et al., 2020).

In learning mathematics, there are several mathematical abilities that must be possessed, one of these abilities is the ability to understand concepts. According to Dwirahayu, so that students can understand the subject matter in mathematics, students must be able to understand the existing concepts in order to be able to solve the problems they face (Dwirahayu, 2007). The ability to understand students' concepts in mathematics lessons is one of the mathematical skills or abilities that are expected to be achieved in learning mathematics, namely by demonstrating understanding of the mathematical concepts they are studying, explaining the relationship between concepts and applying concepts or algorithms in a flexible, accurate, efficient and precise manner in solving problem. The ability to understand mathematical concepts is one of the determinants of learning objectives. If students can understand the concept well, it is hoped that students will be able to master other mathematical skills such as reasoning, problem solving and communication.

Based on the results of observations made by researchers, the mathematics learning process carried out, especially in building materials, still uses the lecture method when carrying out learning activities where the learning process still focuses on the teacher while students only listen and memorize formulas and follow the steps given by the teacher. the teacher, so that students can only solve questions according to what was taught. If the form of the questions is changed students will experience difficulties. This can lead to a lack of students' ability to understand concepts in understanding the material presented. Due to the lack of students' ability to understand concepts, this has a big impact on student learning outcomes. It can be seen in the students' low assignment scores and daily test scores. The indicators for understanding concepts according to (Sumarmo, 2014) are, restating a concept, applying or applying the concept algorithmically.

Teaching aids in mathematics can be interpreted as a set of concrete (real) objects that are designed, arranged and created deliberately and are used to help understand concepts in mathematics. So teaching aids are tools that explain or embody mathematical concepts (Annisah, 2017). According to Subadi (2013), one of the supporters of successful learning and learning outcomes is using teaching aids, especially in mathematics learning. For this reason, in

this research, teaching aids will be used that can help students understand concepts and understand the material of cubes and blocks. The props used are 3-dimensional blocks and cubes made from styrofoam.



Cube Shaped Props



Block Shaped Props

In Junitasari's research, Fanny Hayati (2019) has analyzed students' ability to understand mathematical concepts in cubes and blocks, but in this research she did not use the aid of visual aids. The aim of this research is to find out how students' ability to understand concepts in class VIII A in solving problems on spatial construction material using aids and teaching aids.

RESEARCH METHODS

This research uses a qualitative approach with descriptive research type. Qualitative research is research that focuses on describing and analyzing phenomena, events, social activities,

beliefs, attitudes, perceptions, thoughts of people individually and in groups.

The subjects in this research were students in class VIII A of SMP Negeri 30 Tebo Regency. This data analysis technique uses the Miles and Huberman model (Sugiyono, 2015) such as data reduction, data presentation, and drawing conclusions. The data collection instrument in this research was a written test regarding students' concept understanding abilities and the interview process. The concept understanding ability test questions consist of three indicators, namely restating the concepts that have been studied (questions number 1 and 2), classifying objects according to mathematical concepts (questions number 3 and 4), and applying concepts algorithmically (questions number 5 and 6).

From the results of written tests on students' conceptual understanding abilities, researchers can group research subjects into 3 categories, namely high, medium and low according to the following table:

Table 1 Category of Student Value Groups

Category	Score Range	Number of Subjects
Low Category	$0 \leq x \leq 58$	8
Medium Category	$59 \leq x \leq 85$	17
High Category	$86 \leq x \leq 100$	7

Table 2 Research Subject

N o	Studen t's Name	Sco re	Group
1.	S1	25	Low
2.	S2	41,6	Low
3.	S9	66,6	Mediu m
4.	S11	70,8	Mediu m
5.	S31	91,6	High
6.	S32	100	High

Subjects Low Group Concept Understanding Ability

1. Indicators restate concepts that have been studied (questions no. 1 and 2)

a. Analysis of the work results of S1 subjects

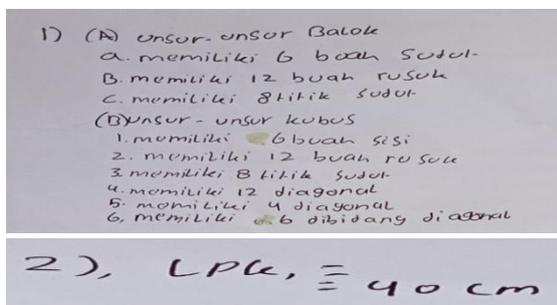


Figure 1 Answer S1 Restates the Concept

Based on the results of subject S1's work on indicators restating the concepts that have been studied, subject S9 has not been able to explain the meaning and elements of blocks and cubes, subject S1 has also not been able to answer question number 2 because he does not know the formula. Therefore, it can be concluded that S1 subjects have not been able to restate the concepts they have learned.

b. Analysis of the work results of S2 subjects

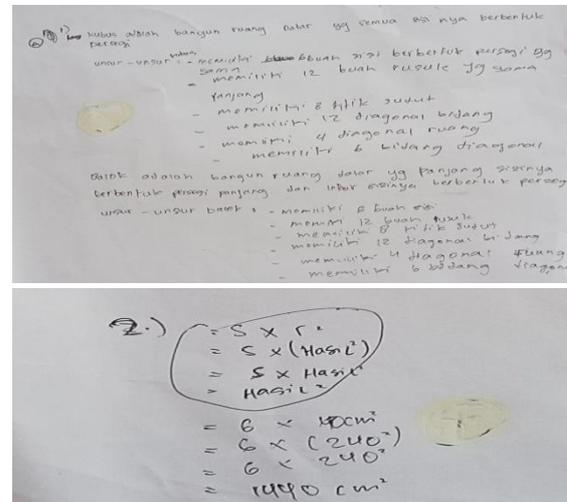


Figure 2 Answer S2 Restates the Concept

Based on the results of the Master's subject's work on indicators restating the concept, the Master's subject has not been able to solve the problem given. Therefore, it can be concluded that the S2 subjects have not been able to restate the concepts they have learned.

2. Indicators classify objects based on mathematical concepts that have been studied (questions no. 3 and 4)

a. Analysis of the work results of S1 subjects

In this question, subject S1 was unable to answer questions number 3 and 4 regarding the elements of blocks and cubes. So in this section the S1 subject does not get any points at all. Therefore, it can be concluded that S1 subjects are unable to classify objects based on mathematical concepts.

b. Analysis of the work results of S2 subjects

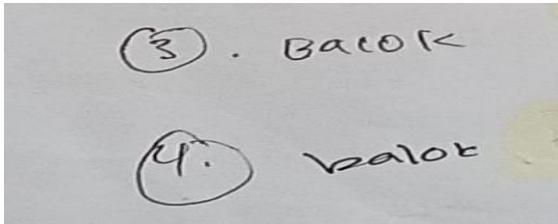


Figure 3 S2 Answer Classifying Objects

Based on Concepts Mathematics
 Based on the results of the Master's subject's work on indicators for classifying objects based on mathematical concepts, the Master's subject has not been able to name the spatial structure in question. Therefore, it can be concluded that S2 subjects have not been able to classify objects based on mathematical concepts.

3. Indicators apply concepts algorithmically that have been studied (questions no. 5 and 6)

a. Analysis of S1 subject work results

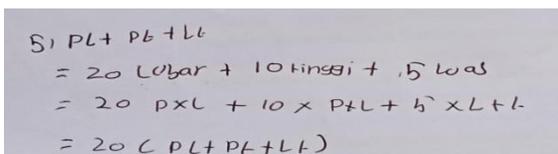


Figure 4 S1 Answer Applying Concepts Algorithmically

Based on the results of S1 subject's work on indicators applying concepts algorithmically, S1 subject has not been able to solve existing problems. Therefore, it can be concluded that S1 subjects have not been able to apply concepts algorithmically.

b. analysis of S2 subjects work results

In this question, subject S2 did not answer all the questions given.

Based on the results of the S2 subject's work on indicators applying concepts algorithmically, the S2 subject has not been able to solve problems regarding the surface area of blocks and cubes. Therefore, it can be concluded that Masters subjects are not yet able to apply concepts algorithmically

Subject Medium Group Concept Understanding Ability

1. Indicators restate concepts that have been studied (questions no. 1 and 2)

a. Analysis of subject S9's work results

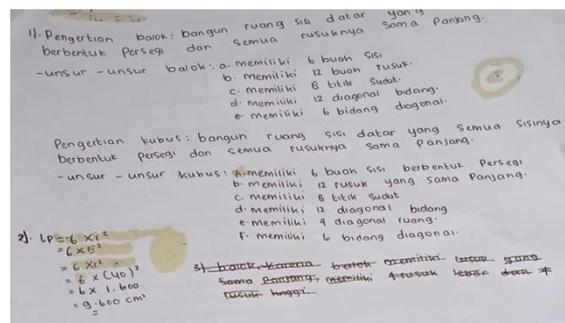


Figure 5 Answer S9 Restates the Concept

Based on the results of subject S9's work on indicators restating a concept that has been studied, subject S9 was able to explain the meaning and elements of a cube, for the meaning of blocks subject S9 still does not understand but for the elements of blocks it is correct. Therefore, it can be concluded that subject S9 is able to restate the concepts that have been learned

b. Analysis of S11 subjects work results

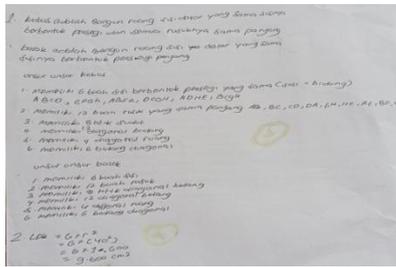


Figure 6 Answer S11 Restates the Concept

Based on the results of subject S11's work on indicators restating the concepts that have been studied, subject S11 was able to explain the meaning and elements of blocks and cubes, although incompletely, while subject S11 was still unable to explain the meaning of blocks correctly. Therefore, it can be concluded that subject S11 is able to restate the concepts that have been studied

2. Indicators classify objects based on mathematical concepts that have been studied (questions no. 3 and 4)

a. Analysis of subject S9's work results

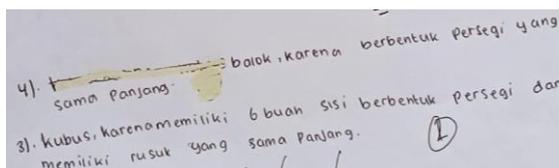


Figure 7 Answer S9 Classifying Objects Based on Mathematical Concepts

Based on the results of subject S9's work on indicators for classifying objects based on mathematical concepts, subject S9 was not able to name the spatial structure in question. Therefore, it can be concluded that subject S9 has not been able to classify objects based on mathematical concepts.

b. Analysis of S11 subjects work result

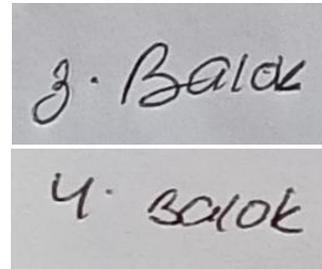


Figure 8 Answer S11 Classifying Objects

Based on Mathematics Concepts Based on the results of subject S11's work on indicators for classifying objects based on mathematical concepts, subject S11 has not been able to name the spatial structure in question. Therefore, it can be concluded that S11 subjects have not been able to classify objects based on mathematical concepts.

3. Indicators apply concepts algorithmically that have been studied (questions number 5 and 6)

a. Analysis of subject S9's work results

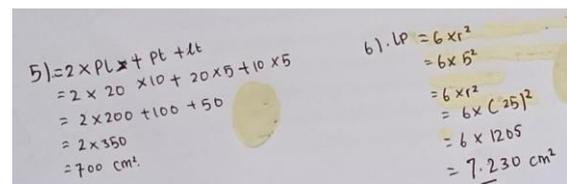


Figure 9 Answer S9 Applying Concepts Algorithmically

Based on the results of subject S9's work on indicators of applying concepts algorithmically, subject S9 was able to understand the questions given so it can be concluded that subject S9 was able to apply concepts algorithmically.

b. analysis of subjects S11 work results

$$\begin{aligned}
 Lp &= 2 \times (p \times l + p \times l + l \times l) \\
 &= 2 \times (20 \times 10 + 20 \times 8 + 10 \times 8) \\
 &= 2 \times (200 + 160 + 80) \\
 &= 2 \times 440 \\
 &= 880 \text{ cm}^2
 \end{aligned}$$

$$\begin{aligned}
 Lp &= 6 \times r^2 \\
 &= 6 \times (25^2) \\
 &= 6 \times 625 \\
 &= 3750 \text{ cm}^2
 \end{aligned}$$

Figure 10 Answer S11 Applying Concepts Algorithmically

Based on the results of subject S11's work on indicators of applying concepts algorithmically, subject S11 was able to correctly state the formula for the surface area of blocks and cubes. It's just that there are problems when adding up the final results. Therefore, it can be concluded that subject S11 is able to apply concepts algorithmically.

Subject High Group Concept Understanding Ability

1. Indicators restate concepts that have been studied (questions no. 1 and 2)

a. Analysis of subject S31's work results

1. Kubus adalah bangun ruang tiga dimensi yang sama sisiya beraturan persegi dan semua rusuknya sama panjang.
 unsur-unsur kubus:
 - memiliki 8 sisi
 - memiliki 12 rusuk
 - memiliki 6 bidang
 - memiliki 12 diagonal bidang
 - memiliki 4 diagonal ruang
 - memiliki 5 bidang diagonal

 2. Balok adalah bangun ruang yang panjang rusuknya tidak sama panjang, memiliki 12 rusuk yang terdiri dari 4 rusuk panjang, 4 rusuk lebar, 4 rusuk tinggi, dan bentuk sisiya dari bangun ruang adalah persegi panjang.
 unsur-unsur balok:
 - memiliki 8 sisi
 - memiliki 12 rusuk
 - memiliki 6 bidang
 - memiliki 12 diagonal bidang
 - memiliki 4 diagonal ruang
 - memiliki 5 bidang diagonal

$$\begin{aligned}
 Lp &= 6 \times r^2 \\
 &= 6 \times 40^2 \\
 &= 6 \times 1600 \\
 &= 9600 \text{ cm}^2
 \end{aligned}$$

Figure 11 Answer S31 Restates the Concept

Based on the results of subject S31's work on indicators restating the concepts that have been studied, subject S31 is able to explain the meaning and

elements of cubes and blocks, and is able to find the surface area of a cube correctly. Therefore, it can be concluded that subject S31 is able to restate the concepts that have been studied.

b. analysis of subject S32 work results

1. Balok adalah bangun ruang tiga dimensi yang terbentuk dari dua bidang datar yang berbeda-beda, yaitu persegi panjang, pada bagian atas dan bagian bawah, memiliki 12 rusuk yang terdiri dari rusuk-rusuk yang sejajar. Sedangkan kubus adalah bangun ruang tiga dimensi yang terbentuk dari dua bidang datar yang sama panjang dan sisi-sisinya berbentuk persegi.
 2. Luas permukaan kubus = $6 \times r^2$
 $= 6 \times 40^2$
 $= 9.600 \text{ cm}^2$

Figure 12 Answer S32 Restates the Concept

Based on the results of subject S32's work on the indicator of restating concepts that have been studied, it can be concluded that subject S32 is able to restate concepts that have been studied well and correctly.

2. Indicators classify objects based on mathematical concepts (questions no. 3 and 4)

a. Analysis of subject S31 work results

3. Bangun ruang balok karena balok memiliki 4 rusuk panjang, 4 rusuk lebar dan 4 rusuk tinggi.
 4. Bangun ruang balok, karena panjang seluruh diagonal bidang tidak sama panjang.

Figure 13 Answer S31 Classifying Objects Based On Mathematical Concepts

Based on the results of subject S31's work on indicators for classifying objects based on mathematical concepts, subject S31 was not able to name the geometric shapes referred to in question number 4. Subject S31 only focused on the

elements of geometric shapes which only have 12 edges in blocks. Therefore, it can be concluded that subject S31 has not been able to classify objects based on mathematical concepts.

b. Analysis of subject S32 work results

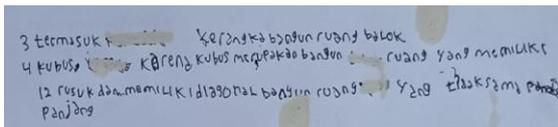
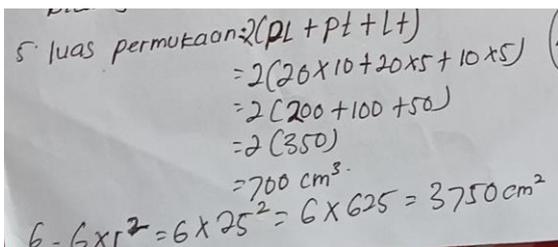


Figure 14 Answer S32 Classifying Objects

Based on Mathematical Concepts
Based on the results of S32's work on indicators for classifying objects based on mathematical concepts, it can be concluded that subject S32 is able to classify objects based on mathematical concepts.

3. Indicators apply concepts algorithmically (questions no. 5 and 6)

a. Analysis of subject S31's work results



Discussion

Based on the analysis of research results regarding the ability to understand mathematical concepts in the material of cubes and blocks using props, it was found that students in the low group generally do not have a good understanding of the concepts and cannot use props correctly. Low group students were only able to solve

Figure 15 Answer S31 Applying Concepts Algorithmically

Based on the results of subject S31's work on indicators applying concepts algorithmically, subject S31 was able to solve problems according to the correct steps. Therefore, it can be concluded that subject S31 is able to apply concepts algorithmically.

b. Analysis of subject S32 work results

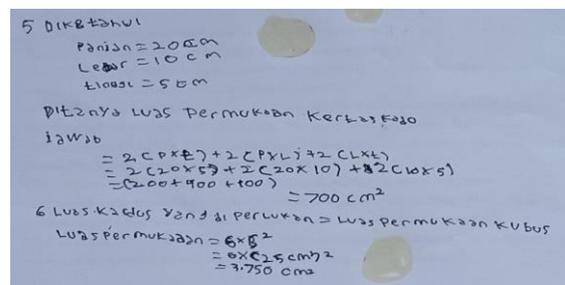


Figure 16 Answer S32 Applying Concepts Algorithmically

Based on the explanation above, a conclusion can be made regarding the characteristics of understanding mathematical concepts regarding block and cube geometric material using teaching aids at each subject level, namely:

questions on the indicator of restating the concepts they had learned. Meanwhile, the indicator applies concepts algorithmically that have been studied and classifies objects based on mathematical concepts, the low group is unable to complete it.

For students in the medium group, it was found that students in the

medium group generally had quite good ability to understand concepts. Medium group students have been able to fulfill the indicators of restating the concepts they have learned and the indicators of applying the concepts algorithmically that they have learned. Meanwhile, in terms of the indicator of classifying objects based on the mathematical concepts that have been studied, students in the medium group are still reversed in answering the existing questions.

Meanwhile, for the high group students, it was found that the high group students generally had a very good understanding of the concept. High group students have been able to fulfill the 3 existing indicators, namely restating the concepts they have learned, classifying objects based on mathematical concepts and applying concepts algorithmically.

CONCLUSION

The conclusions from the research and discussion regarding students' ability to understand concepts in solving problems on the surface area of geometric figures using teaching aids are:

1. The ability to understand mathematical concepts of class VIII A students is generally in the medium category. It can be seen from students with the ability to understand high-level concepts consisting of two subjects S31 and S32, students are able to solve problems on all indicators, namely restating concepts, classifying objects according to certain properties and applying concepts algorithmically. Students with the

ability to understand concepts at a medium level consist of two subjects S9 and S11, students are able to solve problems on indicators restating a concept and are able to solve problems on indicators applying concepts algorithmically. Meanwhile, students with low level abilities consist of two subjects S1 and S2, students are only able to solve problems on the indicator of restating a concept.

2. From the results of the written test, students only mastered two of the three indicators of the ability to understand mathematical concepts. These indicators are restating concepts and applying concepts algorithmically. For the indicator restating the concept, 75% (24 students) were able to master the indicator, while for the indicator classifying objects based on mathematical concepts, 22% (7 students) were able to master the indicator, and the indicator applied the concept algorithmically by 72% (23 students) who were able to master these indicators.

References

- Annisah, S. (2017). Alat Peraga Pembelajaran Matematika. *Tarbawiyah: Jurnal Ilmiah Pendidikan*, 11(1), 1–15.
- Aris Kurniawan, 13 Pengertian Analisis Menurut Para Ahli, Tersedia: <http://www.gurupendidikan.com/13-pengertian-analisis-menurut-para-ahli-didunia/>, Diakses pada tanggal

19 desember 2022.

Cepy Riyana, media pembelajaran, (Jakarta : Dirjen Pendidikan Islam Kemenag RI, 2012), hlm.103.

Dwirahayu, dkk, Pendekatan Baru dalam Proses Pembelajaran Matematika dan Sains Dasar: Sebuah Antologi, (Tangerang: PIC, 2007), hlm 45

Nuraziz, A., S., S., & Fitriyana, N. (2020). Analisis Kemampuan Pemahaman Konsep Siswa Dalam Menyelesaikan Soal-Soal Matematika Kelas Viii Smp Negeri 23 Rejang Lebong. *Journal of Mathematics Science and Education*, 3(1), 17–25. <https://doi.org/10.31540/jmse.v3i1.1037>

Pujiati, Penggunaan Alat Peraga Dalam Pembelajaran Matematika, Yogyakarta, Departemen Pendidikan Nasional Direktorat Jendral Pendidikan Dasar dan Menengah Pusat Pengembangan Penataran Guru Matematika, 2004

Siti Rosiana Romiah, 2019. *ANALISIS KEMAMPUAN PEMAHAMAN KONSEP MATEMATIS SISWA DITINJAU DARI PEMBUATAN MIND MAPPING DI KELAS VIII SMP*

Sugiyono, Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D, (Bandung: Alfabeta, 2016), hlm. 107

Ulilfahmi (2022), Analisis Kemampuan Pemahaman Konsep Matematika Siswa Kelas VIII A MTS Negeri 5 Kebumen Pada Materi Sistem Persamaan Linear Dua Variabel (SPLDV).