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Analysis of Students' Mathematical Concept Understanding Ability in Multiplication Calculation Operation Material

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ABSTRACT

This study aims to investigate fourth-grade students' understanding of mathematical concepts in solving multiplication problems. A qualitative descriptive method was used, involving 28 elementary school students in Bandung, Indonesia. Data were collected through questionnaires, interviews, and documentation, and analyzed using data collection, reduction, display, and conclusion techniques. The test instrument consisted of three descriptive questions with indicators of restating ideas, representing concepts mathematically, and applying algorithmic concepts in problem-solving. An unstructured interview was also conducted to identify students' learning challenges. The results showed that 64% of students could restate a concept, 68% could represent concepts mathematically, and only 18% could apply algorithmic concepts to solve problems. Overall, students' comprehension of mathematical concepts in multiplication procedures was relatively low, with an average achievement of 50%. Factors contributing to this low understanding include lack of attention, inconsistent study habits, and unengaging teaching methods. These findings highlight the need for more effective instructional strategies that emphasize conceptual understanding, student engagement, and consistent learning habits to improve students' ability to apply mathematical principles in problem-solving.

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1. INTRODUCTION

Mathematics is a tool for solving human problems, utilizing data, applying computation expertise, and most importantly thinking like a human to recognize and make use of relationships. Mathematical ability is the ability to face problems both in mathematics and real life (Khairunnisa, 2020). According to Hutagalung (2017) mathematical concepts are arranged hierarchically and systematically, starting with the simplest concepts and working their way up to the most complex concepts, according to its distinctive structure. This claim suggests that conceptual understanding is crucial to mathematics instruction (Netriwati, 2018). In order to solve mathematical problems, students must be willing to correct concepts if they have been taught incorrectly.

The function of conceptual understanding itself is significant, particularly in the learning process because conceptual understanding is a prerequisite for learning more complex mathematical concepts. Comprehending mathematical concepts is crucial because it enables students to solve problems and apply their knowledge in real-world situations (Komariyah et al., 2018). Achieving students' understanding of concepts in mathematics is not an easy thing because understanding a mathematical concept is done individually. Each student has different abilities in understanding mathematical concepts.

According to Mulyani et al. (2018), knowing mathematical concepts entails being able to distinguish between various concepts that are mutually exclusive, comprehend concepts, and perform useful calculations in larger scenarios or problems. In line with this Hutagalung (2017) according to his research, understanding mathematical concepts involves being able to interpret ideas or concepts, categorize mathematical objects, apply concepts algorithmically, translate mathematical concepts into one's own language, and connect disparate concepts.

Furthermore, the Ministry of National Education (Undang-Undang Republik Indonesia Nomor 20 Tahun 2003, 2003) states that the objectives of mathematics learning include that students can: 1) understand mathematical concepts, explain the relationship between concepts and apply concepts or algorithms, flexibly, accurately, efficiently, and precisely in solving problems, 2) using reasoning on patterns and properties, carrying out mathematical manipulations in making generalizations, compiling evidence, or explaining mathematical ideas and statements, 3) solving problems which include the ability to understand problems, design mathematical models, complete models and interpret the solutions obtained, 4) communicate ideas with symbols, tables, diagrams, or other media to clarify situations or problems, and 5) have an attitude of appreciating the usefulness of mathematics in life, namely having curiosity, attention, and interest in studying mathematics, as well as a tenacious and confident attitude in solving problems. Teaching materials play an important role in facilitating the teaching and learning process. Therefore, teachers need to prepare teaching materials that can engage students and help them understand and relate mathematical concepts (Schott et al., 2020; Ulva & Fitri, 2022).

When students are able to define concepts, recognize and provide examples or non-examples of concepts, become proficient at drawing mathematical connections between different ideas, comprehend how mathematical ideas relate to one another so that a comprehensive understanding is developed, and use mathematics in context outside of mathematics, they are considered to have understood concepts. Understanding is a fundamental skill that students need to acquire in order to learn more complex mathematical concepts, so understanding concepts themselves is important for learning

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(Umam & Zulkarnaen, 2022). Researchers are interested in examining students' comprehension of concepts encountered in multiplication material based on the issues raised above. It is hoped that this analysis will serve as a guide for creating additional education that can foresee the emergence of limitations in the material used for multiplication.

2. METHODS

This research uses a qualitative research approach with descriptive methods (Roosinda et al., 2021). The qualitative descriptive method aims to describe the learning obstacles experienced by students in the material on arithmetic operations, and multiplication of natural numbers. This research was carried out at BPI Elementary School, Bandung City for the 2023/2024 academic year. The subjects in this research were 22 third-grade elementary school students. Techniques for gathering data include questionnaires, interviews, and documentation. A Respondent Ability Test (TKR) question sheet with five multiplication-related questions was used to administer the test. Confirmation of student responses from test results is done through interviews. As research evidence, documentation is completed using an assortment of images and response files. Data collection, data reduction, data display, and conclusion are the methods of data analysis that are employed.

3. RESULTS AND DISCUSSION

The results of this research are divided into three indicators of the ability to understand concepts, namely restating a concept, presenting a concept into a mathematical representation, and applying algorithm concepts in problem-solving.

3.1. *Mrestate a concept*

Students were asked to convert addition operations into multiplication to measure their ability to re-express a concept. The following are the students' answers shown in Figure 1.

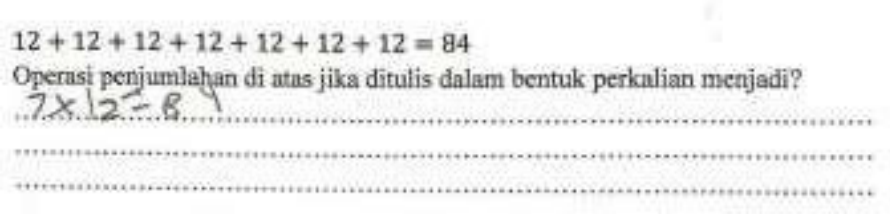

Figure 1. Student answers in restating a concept.

In **Figure 1** above, students can re-solve a concept contained in the question, they are asked to write it in multiplication form and students can understand a concept contained in question number 2. This means students restate a concept correctly, forexample, 7 x 12 = 84. By theory three learning domains, three learning objectives are listed (Lafendry, 2023). According to Figure 1, the interrelated domains of cognitive, affective, and psychomotor are as follows: cognitive (ability to understand) refers to students' capacity to learn the subject matter, comprehend its meaning, translate, and express it in their own words. Operational words can be used to classify, criticize, explain, restate, rearrange words, and more. This is demonstrated by Figure 1's operational words' ability in the cognitive

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domain, which allows students to comprehend the mathematical concept of multiplication and restate what is taught inthe problem.

3.2 *MPresent concepts into mathematical representation*

Students were asked to express a problem in mathematical form to assess their ability to present concepts in mathematical representation. An example of a student's answer is shown in **Figure 2**.

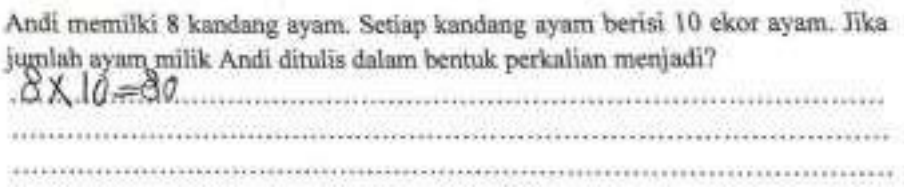
Andi memiliki 8 kandang ayam. Setiap kandang ayam berisi 10 ekor ayam. Jika jumlah ayam milik Andi ditulis dalam bentuk perkalian menjadi?
8 X 10 = 80

Figure 2. Students' answers in presenting concepts into mathematical representation.

In **Figure 2** above there is a short story question about a chicken, where a chicken is categorized as a representation so that students can answer correctly because the questions given are easy to understand. This means that students can present concepts in mathematical representation. According to theory " three learning domains " (Lafendry, 2023), explains that the three interrelated domains that make up learning outcomes—cognitive, affective, and psychomotor—are consistent with Figure 2's cognitive (application ability) ability to use theories. or, in some circumstances, abstractions, formulas, or principles. The verbs apply, find, organize, modify, and solve are among those employed. This is demonstrated by Figure 2 with cognitive domain verbs, where students are able to transform ideas into mathematical representations found in the given questions.

3.3 *Mapply algorithm concepts in problem solving*

To show how students apply algorithmic thinking to determine the total number of items in a word problem, examples of student answers are shown in **Figure 3**.

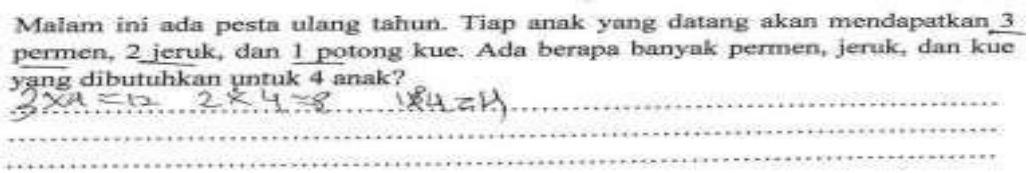
Malam ini ada pesta ulang tahun. Tiap anak yang datang akan mendapatkan 3 permen, 2 jeruk, dan 1 potong kue. Ada berapa banyak permen, jeruk, dan kue yang dibutuhkan untuk 4 anak?
3 X 4 = 12 2 X 4 = 8 1 X 4 = 4

Figure 3. Student answers apply algorithm concepts in problem solving.

Figure 3 contains a problem that must be solved by students regarding the problem of all the food for 4 people. The problem that students have to solve is how much of each food is needed by 4 children, and as a result, students can apply algorithm concepts in problem-solving. Based on this, according to theory three learning domains (Lafendry, 2023), claims that there are three interconnected learning outcomes: affective, psychomotor, and cognitive. However, Figure 3 shows that the cognitive domain— which, more specifically, comprises application skills that make use of theory and abstraction in specific contexts—is in line with this. The verbs that are typically used to describe these kinds of applications are organize, change, solve, etc. This has to do with Figure 3 and application skills; specifically, students are able to use algorithmic concepts when solving problems.

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4. CONCLUSION

According to the aforementioned analysis, class III elementary school students' overall conceptual understanding when working on multiplication calculation operations is only 50%. According to the data study's findings, 64% of students were able to restate a concept, 68% were able to present concepts in mathematical representations, and 18% were able to apply algorithm concepts to solve problems. Overall, a number of causative factors, such as a lack of focus during study sessions, inconsistent study habits, and uninteresting teaching strategies, affect students' low percentage of mathematical concept understanding. Consequently, it can be said that students' comprehension of mathematical ideas and their ability to solve mathematical problems involving multiplication material remain deficient. Put differently, there is still a low level of understanding of mathematical concepts among students.

According to the research, students can increase their concentration and focus by overcoming their low understanding of mathematical concepts. Teachers should also provide practice questions that connect different concepts in the learning process and provide examples and non-examples of concepts when conveying focused concepts in mathematics lessons.

5. REFERENCES

Hutagalung, R. (2017). Peningkatan kemampuan pemahaman konsep matematis siswa melalui pembelajaran guided discovery berbasis budaya toba di smp negeri 1tukka. *Journal of Mathematics Education and Science*, *2*(2), 70–77.

Khairunnisa, N. C. (2020). Analisis kemampuan pemahaman konsep matematis dalam menyelesaikan soal materi SPLDV pada siswa SMP. *Sesiomadika*, 546–554.

Komariyah, S., Septi, D., Afifah, N., dan Resbiantoro, G. (2018). Analisis pemahaman konsep dalam memecahkan masalah matematika ditinjau dari minat belajar siswa. *SOSIOHUMANIORA: Scientific Journal of Social Sciences and Humanities*, *4*(1), 1–8.

Lafendry, F. (2023). Teori pendidikan tuntas mastery learning Benyamin S.Bloom. *Tarbawi*, *6*(1), 1–12.

Mulyani, A., Indah, E. K. N., dan Satria, A. P. (2018). Analisis kemampuan pemahaman matematis siswa SMP pada materi bentuk aljabar. *Mosharafa: Jurnal Pendidikan Matematika*, *7*(2), 251–262.

Netriwati. (2018). Penerapan taksonomi bloom revisi untuk meningkatkan kemampuan pemahaman konsep matematis. *Desimal: Jurnal Matematika*, *1*(3), 347–352. https://doi.org/10.24042/djm.v1i3.3238

Roosinda, F. W., Lestari, N. S., Utama, A. A. G. S., Anisah, H. U., Siahaan, A. L. S., Islamiati, S. H. D., Astuti, K. A., Hikmah, N., dan Fasa, M. I. (2021). *Metode penelitian kualitatif*. Zahir Publising.

Schott, C., van Roekel, H., and Tummers, L. G. (2020). Teacher leadership: A systematic review, methodological quality assessment and conceptual framework. *Educational Research Review*, *31*, 100352. https://doi.org/10.1016/j.edurev.2020.100352

DOI: http://dx.doi.org/10.17509/xxxx.xxxx
e-ISSN 2656-4025

Ulva, Y., dan Fitri, A. (2022). Analisis kebutuhan modul matematika untuk meningkatkan kemampuan pemecahan masalah siswa SMPN 4 Batang. *Jurnal of Nusantara Education*, *2*, 11–21. https://doi.org/10.57176/jn.v2i1.38

Umam, M. A., dan Zulkarnaen, R. (2022). Analisis kemampuan pemahaman konsep matematis siswa dalam materi sistem persamaan linear dua variabel. *Jurnal Educatio*, *8*(1), 303–312. https://doi.org/10.31949/educatio.v8i1.1993

Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 (2003).

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