Current Research in Education: Conference Series Journal

Journal homepage: https://ejournal.upi.edu/index.php/crecs

Analysis of the Achievement of Fourth Grade Students at SDN 029 Cilengkrang in Solving Multiplication Problems

Sarah Anida Putri [1], Siti Maryam Rohimah [2], Yusup Nurdiansah [3], Salma Nur Anaya [4]*

Pendidikan Guru Sekolah Dasar, Universitas Pasundan, Bandung, Indonesia

*Correspondence: E-mail: sarahanidaputri@gmail.com

ABSTRACT

This study aims to analyze elementary school students' ability to solve multiplication problems and identify the types of errors they make. The research subjects consisted of 25 fourth-grade students from SDN 029 Cilengkrang. The research method used is a case study with the instrument being a written test containing five contextual questions, but the detailed analysis is focused on question number 3. The research results show that 28% of students are in the high ability category, 48% are in the medium category, and 24% are in the low category. The most common errors made by students with moderate and low abilities include errors in modeling word problems, calculation procedure errors, and errors in transforming verbal sentences into mathematical model form. These findings indicate that high-ability students are capable of understanding multiplication concepts and procedures, while some students are still focused on memorizing multiplication results and have not fully grasped their conceptual meaning. Therefore, learning should focus on strengthening the understanding of multiplication concepts thru contextual activities and visual representations to improve students' overall conceptual and procedural abilities.

ARTICLEINFO

Article History:
Submitted/Received 02 Nov 2023
First Revised 15 Jan 2024
Accepted 01 Mar 2024
First Available online 01 May 2024
Publication Date 01 Aug 2024

Keyword:
Achievement Analysis,
Elementary School,
Misconceptions,
Multiplication,
Student Ability.

1. INTRODUCTION

The word "mathematics" comes from the Latin word "mathematike," which was originally taken from the Greek word "mathematike," meaning "to learn." The word has its origin in the word mathema, which means knowledge or science. The word mathematike is also related to other almost identical words, namely mathein or mathenein, which means to learn (to think). So, referring to its etymology, the word "mathematics" refers to knowledge obtained thru thinking (reasoning). According to Russeffendi, mathematics emphasizes activities in the world of ratios (reasoning), rather than emphasizing the results of experiments or observations. Mathematics is formed by human minds, which are related to ideas, processes, and reasoning (Rahmah, 2013).

It is this fundamental quality of reasoning that is then mandated to be developed within the Indonesian formal education system. Based on Law No. 20 of 2003, mathematics is a compulsory subject taught from primary to secondary education. The objectives of elementary school mathematics learning according to the Ministry of National Education (2006) include: 1) understanding mathematical concepts, explaining the relationships between these concepts, and then applying the concepts/algorithms flexibly, accurately, efficiently, and appropriately in problem-solving; 2) using reasoning on patterns, properties, performing mathematical manipulations in generalizations, constructing proofs, or explaining mathematical ideas and statements; 3) solving problems, including the ability to understand problems, design mathematical models, solve the models, and interpret the solutions obtained; 4) communicating ideas using symbols, tables, diagrams, or other media to explain situations or problems; 5) having an appreciation for the use of mathematics in daily life. Based on this objective, it can be understood that mathematics plays an important role in the development of science and technology. Elementary school mathematics learning needs to develop elementary school students' critical and creative thinking skills, especially when understanding the concept of multiplication.

Conceptually, multiplication is a form of repeated addition of the same number (Walle et al., 2018). For example, 4 × 3 can be interpreted as 4 added three times (4 + 4 + 4), or as three groups each containing four objects. This understanding is important so that students not only memorize the product, but also understand the meaning of the relationship between the number of groups and the number of members in each group. This basic concept serves as a foundation for students to develop representation and problem-solving skills in more complex contexts.

Nevertheless, the ideal of these learning objectives has not been fully achieved in practice. Conditions on the ground show that students' conceptual and procedural understanding often does not align with expectations. Students who can memorize algorithms don't necessarily understand the meaning behind the calculation process, so the application of mathematical thinking in daily life is still limited. Based on the research conducted by Prayoga et al. (2024), students' errors in solving multiplication word problems include: (1) inability to understand the language in the problem, (2) lack of mastery of problem-solving strategies, (3) unfamiliarity with word problems, (4) lack of thoroughness in performing calculations, and (5) lack of understanding of basic arithmetic concepts. Consistent with the research findings of Hanik and Liansari (Hanik & Liansari, 2023), similar errors are also influenced by ineffective teacher-student communication, non-conducive seating arrangements, and a lack of understanding of concepts and stacked operational procedures.

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
e- ISSN 2656-4025

While these studies have identified common student errors, more specific and contextual analysis is still needed to map student achievement profiles – whether high, medium, or low and to identify dominant error patterns in the local environment, such as at SDN 029 Cilengkrang. One mistake in the initial step can lead to errors in subsequent steps, considering that mathematics demands precision and sequential thinking. Therefore, this study aims to deeply analyze the achievement level of fourth-grade students at SDN 029 Cilengkrang in solving multiplication problems. Thus, this research is expected to serve as a basis for teachers in developing learning strategies that can balance students' conceptual and procedural understanding.

2. METHODS

This research uses a case study method with a descriptive-analytical approach (Ilhami et al., 2024; Rusandi & Rusli, 2021; Younas & Inayat, 2025), which involves an in-depth examination of students' achievements in solving multiplication problems in Grade IV. This approach allows the researcher to describe the phenomenon while also analyzing students' characteristics and errors in solving multiplication problems. The research subjects were 25 fourth-grade students from SDN 029 Cilengkrang, who were analyzed based on high, medium, and low ability levels. The selection of representative subjects was done by considering test results as well as students' ability to express their opinions.

The research tool consists of five essay questions of varying difficulty levels, as shown in **Table 1**, designed to measure students' ability to apply multiplication concepts in everyday contexts. These questions measure the following indicators:

1. Understanding the concept of multiplication.
2. Transforming word problems into mathematical models.
3. Selecting the appropriate operational procedures.
4. Arranging the steps of the solution in a logical sequence.

Table 1. Multiplication questions.

Q1	1. Andi memilki 8 kandang ayam. Setiap kandang ayam berisi 10 ekor ayam. Jik jumlah ayam milik Andi ditulis dalam bentuk perkalian menjadi?	1. Andi has eight caged chickens. Every pen chicken contains ten heads of chick If the amount of chicken Andi's was written in form multiplication be? ....
Q2	2. $12 + 12 + 12 + 12 + 12 + 12 + 12 = 84$ Operasi penjumlahan di atas jika ditulis dalam bentuk perkalian menjadi?	2. $12 + 12 + 12 + 12 + 12 + 12 + 12 = 84$ Should the addition operation above, if written as multiplication, be? ....
Q3	3. Ada 6 biskuit tiap kotak.  Tulislah bentuk perkalian yang tepat untuk mendapatkan banyaknya semua biskuit. a. Bilangan berapakah yang kita kalikan dengan 6 untuk memperoleh hasilnya? .... b. Ada berapa banyak biskuit semuanya?	3. There are six biscuits in each box.  Write it down from exact multiplication to get lots of biscuits. a. Number: how much do we multiply by 6 to get the result? .... b. Are there? All the biscuits? ....
Q4	4. Ada 7 hari dalam seminggu. Ada berapa hari dalam 3 minggu?	4. There are seven days in a week. How many days are there? In 3 weeks? ....

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

Q5	5. Malam ini ada pesta ulang tahun. Tiap anak yang datang akan mendapatl permen, 2 jeruk, dan 1 potong kue. Ada berapa banyak permen, jeruk, dai yang dibutuhkan untuk 4 anak? …… ……	5. It's there tonight. Each child will get three candies, two oranges, and one piece of cake. How many are there? Candy, oranges, and cookies needed for four children? …… ……

Although the instrument consists of 5 questions, the focus of the in-depth analysis in this study is on question number 3. This question was chosen because it is considered to represent the main difficulty students have in applying the concept of multiplication to everyday situations, thus facilitating the case study to examine conceptual and procedural errors in detail. The other questions were still given to the students for general evaluation purposes, but the detailed analysis was limited to question number 3.

The data collection and analysis procedure was carried out in several steps:

1. Five questions were given to all students to be completed in writing.
2. Students' answers were collected and analyzed to identify errors and achievements in solving multiplication problems.
3. Representative subjects were selected from each ability category (high, medium, low) based on test results and teacher consideration.
4. The results of the analysis of students' answers in each category were described, with a detailed focus on question number 3 as a case study.

Test results were analyzed by calculating the percentage of scores obtained by the students:

$$A = \frac{S}{SK} \times 100$$

Explanation:

S = the total score obtained by the student

SK = the maximum score.

Based on the percentage, students' proficiency levels are categorized as follows, as shown in **Table 2** (Mubarok & Fitriani, 2020).

Table 2. Score conversion.

Percentage	Category
80 – 100	High
60 – 79	Medium
≤ 59	Low

After each student's score was categorized, the data was tabulated to see the number of students in each ability category. For example, students with scores of 80–100 were categorized as high, 60–79 as medium, and ≤59 as low.

3. RESULTS AND DISCUSSION

This study aims to analyze the level of fourth-grade students' ability at SDN 029 Cilengkrang in solving multiplication problems. Data were obtained thru a written test administered to 25 students and analyzed based on high, medium, and low ability categories (**Table 3** and **Table 4**).

Table 3. Student ability levels.

Score	Number of Students Level	Ability Level
90	2	High
85	1	High
80	3	High

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
e- ISSN 2656-4025

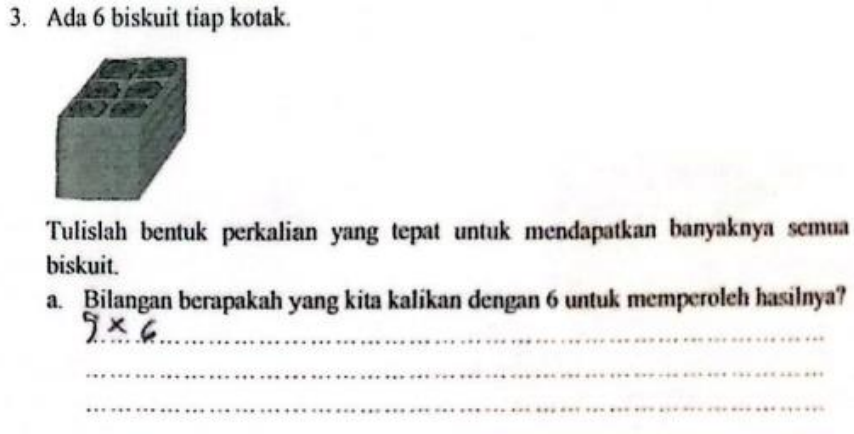
Score	Number of Students Level	Ability Level
75	6	Medium
70	2	Medium
65	3	Medium
60	1	Medium
55	3	Low
50	1	Low
45	1	Low
40	2	Low

The test results indicate variations in the ability of fourth-grade students to solve multiplication problems. Out of 25 students, 7 were categorized as high ability, 12 as average, and 6 as low ability (**Table 3**). This data was then converted into percentages, with high-ability students accounting for 28%, average 48%, and low 24% (**Table 4**). These percentages were used to see the proportion of students in each ability category, making it easier to analyze overall class achievement. Detailed analysis focused on question number 3, which represents students' main difficulty in applying the concept of multiplication to contextual problems and mathematical models. The findings indicate differences in error characteristics and achievement based on students' ability levels.

Table 4. Percentage of student ability levels.

Ability Level	Number of Students	Percentage
High	6	28 %
Medium	12	48 %
Low	7	24 %

Based on the table above, most students have grasped the basic concept of multiplication, but there are still some students who struggle to apply the concept to word problems or mathematical models. This finding is consistent with the research (Indriani et al., 2022), (Meilida, 2022) which states that students tend to focus on memorizing multiplication results without understanding their conceptual meaning, and are not yet able to convert word problems into mathematical models. This is also supported by (Fauza et al., 2023; Wahyuni & Darmawan, 2023) which confirms that errors in understanding the concept of multiplication cause students to fail to solve problems correctly. Furthermore, the analysis of student responses revealed differences in error characteristics based on ability level (**Figures 1, Figures 2,** and **Figures 3**).


3. Ada 6 biskuit tiap kotak.

Tulislah bentuk perkalian yang tepat untuk mendapatkan banyaknya semua biskuit.

a. Bilangan berapakah yang kita kalikan dengan 6 untuk memperoleh hasilnya?

7 × 6

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

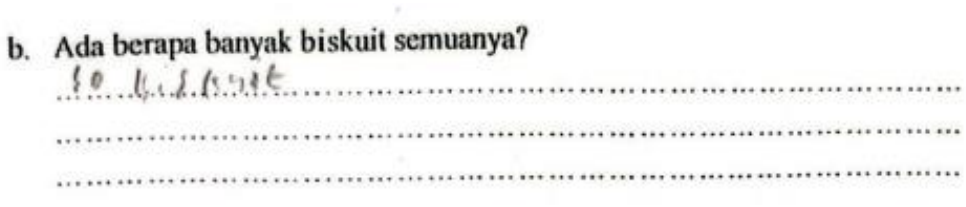


Figure 1. Answer from a 4th-grade student with high ability**.**

Based on the analysis of question number 3 on the student worksheet (Figure 1), it was found that high-ability students demonstrated good mastery of both conceptual and procedural aspects. In question 3a, students were asked to identify the appropriate multiplier in the context of the problem and successfully translate a real-life situation namely, 5 boxes containing 6 biscuits per box into the mathematical model 5 × 6. This indicates that conceptually, students understand how to determine the total amount. Next, in question 3b, which asks students to execute the calculation from the model, students were able to provide the correct result, which is 30 biscuits. This finding confirms that high-ability students can solve multiplication problems accurately, both in terms of conceptual understanding and procedural skills. Next, the analysis of students with moderate abilities will be explained based on **Figure 2**.

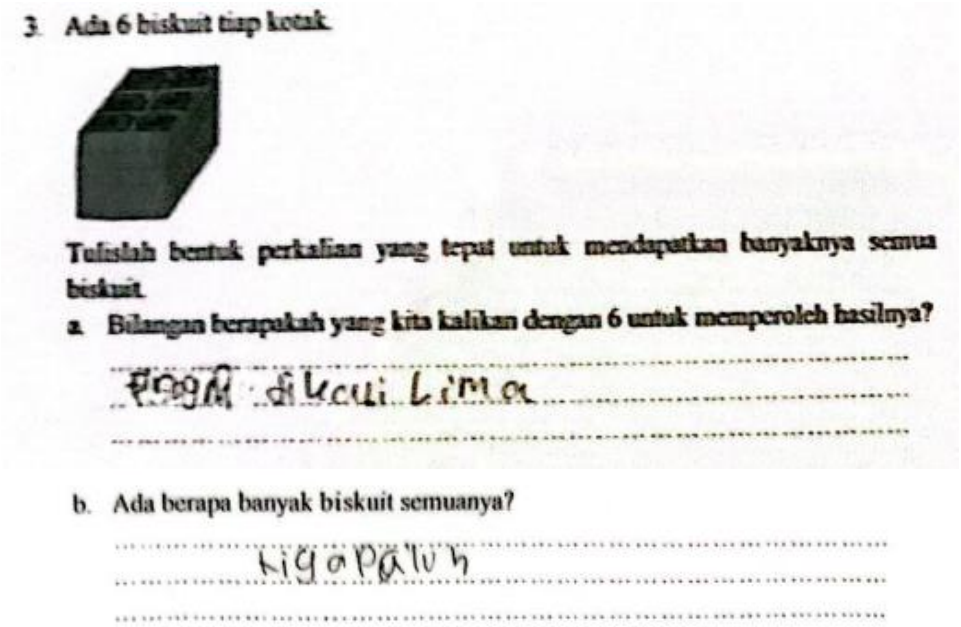


Figure 2. Answers from 4th grade students with moderate ability.

For students in the intermediate ability category (**Figure 2**), they generally understand the concept of multiplication in general, but are not yet able to write down the calculation procedure in the form of symbols or mathematical operations. Some students only answered with narrative sentences, for example, in question 3a they wrote 'six times five' and in question 3b 'thirty'. Mathematically, this student successfully solved the problem correctly, both in terms of concept and calculation. The choice to write using spelling is a variation in representation.

This is in line with Dwiyono dan Tasik (Dwiyono & Tasik, 2021), which states that one of the difficulties in multiplication calculations is understanding symbols. This finding is also supported by Labibah et al. (2021), who stated that the error falls into the category of transformation errors, namely the student's inability to choose the appropriate procedure

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
e- ISSN 2656-4025

or formula for the problem. This error is caused by a lack of understanding of the problem, carelessness in reading, and the students' habit of not being accustomed to writing out the steps of the calculation systematically. Next, the analysis of low-ability students will be explained based on **Figure 3**.

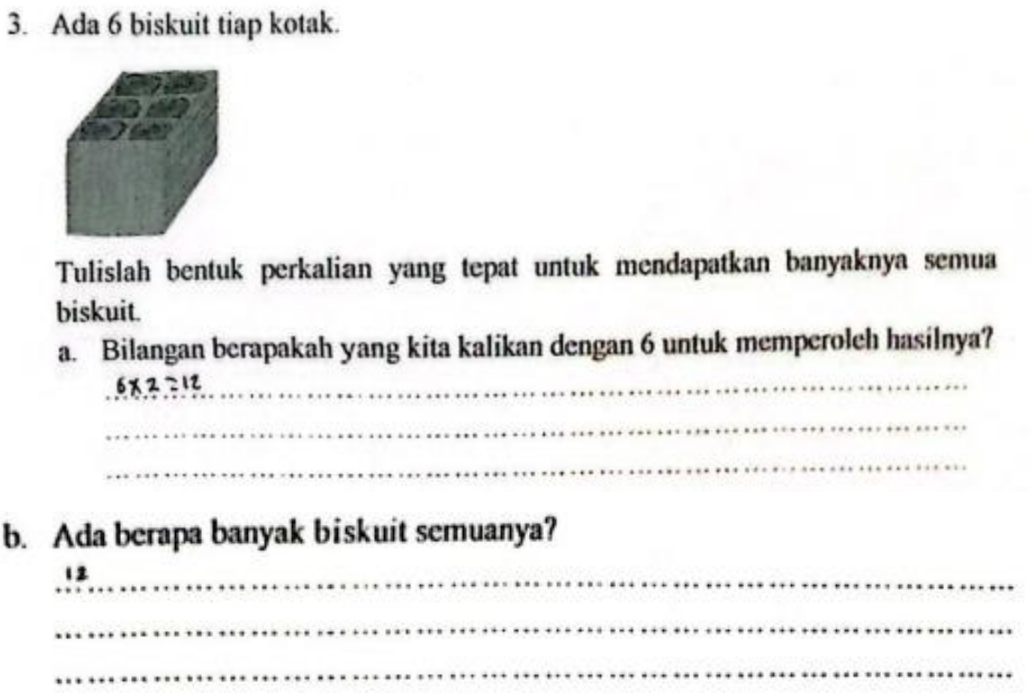


Figure 3. Answers from 4th grade students with low ability.

Analysis of student responses with low ability (**Figure 3**) indicates conceptual errors and difficulties in modeling the problem. In question 3a, the student wrote the answer "6 × 2 = 12," even tho the context of the question stated there were 5 boxes each containing 6 biscuits, making the correct operation 5 x 6, and the appropriate answer to the question "What number do we multiply by 6?" should have been "5." The student's answer of "2" indicates a failure to identify the number of groups, resulting in a fundamental error in understanding the word problem.

In question 3b, the student wrote the answer "12," even tho the correct number of biscuits should be 30 (5 x 6 = 30). This error is consistent with the error in question 3a, indicating that the main issue is not the ability to calculate the student is able to calculate 6 x 2 = 12 but rather the inability to model the mathematical situation correctly. Sihombing et al. (2023) emphasizing that students with low abilities often fail to understand the meaning of word problems, while Labibah et al. (2021) This is referred to as a process skills error, which is the inability of students to perform correct calculations due to a misunderstanding of concepts.

Overall, the research results indicate variations in students' ability to solve multiplication problems. High-ability students are able to understand the concept of multiplication and execute calculations accurately, medium-ability students understand the concept but sometimes write calculation procedures in narrative form, while low-ability students have difficulty modeling word problems and applying multiplication procedures correctly. This finding confirms the need to strengthen students' conceptual understanding and procedural skills. Improvement efforts can be made thru context-based practice and the use of

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

interactive digital media that facilitate the visualization of multiplication concepts and help students solve word problems systematically.

4. CONCLUSION

Based on the analysis and discussion, it can be concluded that the ability of fourth-grade students at SDN 029 Cilengkrang to solve multiplication problems still varies. Some students have grasped the basic concept of multiplication and can apply the procedure correctly, while others still struggle with understanding the concept and applying it to contextual problems. Based on the test results, 28% of students are in the high category, 48% in the medium category, and 24% in the low category. The errors found in the students include: errors in modeling word problems, errors in calculation procedures, and errors in transforming verbal sentences into mathematical model form. These findings indicate that students' understanding of the concept of multiplication is not uniform; high-ability students are able to understand the concept and procedures, average-ability students understand the concept but are not yet accustomed to formally writing down the calculation steps, while low-ability students have difficulty connecting the problem context with the appropriate mathematical model. This conclusion is based on a detailed analysis of question number 3 as a case study, which confirms that some students are still focused on memorizing multiplication results and require reinforcement of conceptual understanding.

5. ACKNOWLEDGMENT

The author would like to express sincere gratitude to SDN 029 Cilengkrang for granting permission and providing support during the data collection process. Special thanks are also extended to the students and teachers who participated in this study. The author is deeply grateful to the Faculty of Teacher Training and Education, Universitas Pasundan, for their valuable guidance and feedback throughout the research process. Finally, the author would like to express appreciation to the committee of the International Conference on Primary and Early Childhood Education (ICPECE), Universitas Pendidikan Indonesia, for the opportunity and support in disseminating this research.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. All authors contributed equally to the conceptualization, data collection, analysis, and writing of this manuscript. The authors also confirm that this article is original and free from plagiarism.

7. REFERENCES

Dwiyono, Y., dan Tasik, H. K. (2021). Analisis kesulitan belajar operasi hitung perkalian matematika siswa kelas IV SD Negeri 019 Samarinda ULU. *Jurnal Ilmu Pendidikan LPMP Kalimantan Timur* , *1*, 175–190.

Fauza, A., Kinanti, A., dan Sari, R. K. (2023). Analisis kesalahan siswa dalam menyelesaikan soal perpangkatan bentuk akar. *Jurnal Ilmiah Penelitian Mandira Cendikia*, *1*(1), 8–11.

Hanik, U., dan Liansari, V. (2023). Analisis kesalahan peserta didik dalam menyelesaikan soal operasi hitung perkalian dan pembagian kelas III sekolah dasar. *Pendas: Jurnal Ilmiah*

Pendidikan Dasar, *8*(2), 4596–4609.

Ilhami, M. W., Nurfajriani, W. V., Mahendra, A., Sirodj, R. A., dan Afgani, M. W. (2024). Penerapan metode studi kasus dalam penelitian kualitatif. *Jurnal Ilmiah Wahana Pendidikan*, *10*(9), 462–469.

Indriani, N., Salsabila, Z. P., dan Firdaus, A. N. A. (2022). Pemahaman konsep perkalian dengan menggunakan metode RME pada peserta didik kelas III MI Miftahul Huda. *AULADUNA: Jurnal Pendidikan Dasar Islam*, *9*(1), 105–113. https://doi.org/10.24252/auladuna.v9i1a9.2022

Labibah, N., Damayani, A. T., dan Sary, R. M. (2021). Analisis kesalahan siswa berdasarkan teori newman dalam menyelesaikan soal cerita pada materi pecahan kelas V Madrasah Ibtidaiyah. *Journal for Lesson and Learning Studies*, *4*(2), 208–216.

Meilida, A. (2022). Analisis kesulitan mengerjakan perkalian dan pembagian pada siswa kelas VI di SDN Dangu Hulu Sungai Tengah. *Pahlawan: Jurnal Pendidikan-Sosial-Budaya*, *18*(2), 38–45. https://doi.org/10.57216/pah.v18i2.494

Mubarok, R., dan Fitriani, N. (2020). Analisis pencapaian siswa SMP dalam menyelesaikan soal persamaan linear dua variabel di SMPN 1 Campaka Mulya-Cianjur. *JPMI : Jurnal Pembelajaran MAtematika Inovatif*, *3*(5), 507–516. https://doi.org/10.22460/jpmi.v3i5.507-516

Prayoga, F. I., Masruroh, N., dan Safitri, N. V. (2024). Pentingnya profesionalisme guru dalam meningkatkan kualitas pendidikan Indonesia. *Social, Humanities, and Educational Studies (SHES): Conference Series*, *7*(3). https://doi.org/10.20961/shes.v7i3.91633

Rahmah, N. (2013). Hakikat pendidikan matematika. *Al-Khwarizmi : Jurnal Pendidikan Matematika Dan Ilmu Pengetahuan Alam*, *1*(2), 1–10. https://doi.org/10.24256/jpmipa.v1i2.88

Rusandi, dan Rusli, M. (2021). Merancang penelitian kualitatif dasar/deskriptif dan studi kasus. *Al-Ubudiyah: Jurnal Pendidikan Dan Studi Islam*, *2*(1), 48–60. https://doi.org/10.55623/au.v2i1.18

Sihombing, J. M., Syahrial, dan Manurung, U. S. (2023). Kesulitan peserta didik dalam pembelajaran matematika materi perkalian dan pembagian di sekolah dasar. *Jurnal Didaktika Pendidikan Dasar*, *7*(3), 1003–1016. https://doi.org/10.26811/didaktika.v7i3.1177

Wahyuni, S., dan Darmawan, P. (2023). Analisis kesalahan pemahaman konsep perkalian siswa dan solusinya: Penerapan metode APKL dan diagram fishbone. *Kognitif: Jurnal Riset HOTS Pendidikan Matematika*, *3*(1), 49–71. https://doi.org/10.51574/kognitif.v3i1.745

Walle, J. A. V. de, Lovin, L. H., Karp, K. S., and Bay-Williams, J. M. (2018). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades preK-2* (Third edition). Pearson.

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

Younas, A., and Inayat, S. (2025). Choosing an analytical approach in case study research. *Creative Nursing*, *31*(1), 90–92. https://doi.org/10.1177/10784535241306773

DOI: http://dx.doi.org/10. 17509/xxxx.xxxx
e- ISSN 2656-4025