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Analysis Error Student in Solving Problem Logarithm Based on the Kastolan Procedure

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ABSTRACT

Mathematics is very important in teaching students to have and apply mathematical thinking patterns in everyday life and become a reference for studying various other branches of science. One of the mathematics materials is logarithms, where students often make mistakes when solving these problems, so it can indicate how far students have mastered the logarithm material chosen for this research because logarithms have properties that students must understand. So, this research aims to analyze the errors made by students when solving logarithm problems using the Kastolan procedure. Subject in this study, nine students from class X IT SMKS, Darel Hikmah Pekanbaru. The research instrument used a 5-item logarithmic description test instrument. The data analysis techniques are data reduction, data presentation, and conclusion. Based on the research data results, it was concluded that students made conceptual errors, namely the inability to apply the concept of the properties used. Procedural errors were when students were unable to solve the problem until they got the final solution, and technical errors occurred because they made mistakes in calculations to produce answers wrong.

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INTRODUCTION

Mathematics is a branch of science that assesses students' difficulty studying [1]. Mathematics is seen as a difficult subject because it has abstract, systematic, logical characteristics and various confusing formulas [2]. On the side On the other hand, mathematics is also a basic science used in various aspects of life [3]. Mathematics is based on the development of science and technology, which have an important role in the socio-economic development of a country, so mathematics is considered mandatory in school study [4]. There are many sciences on which discovery and development depend on mathematics. All Life problems that require careful and thorough solutions inevitably have to turn to mathematics [5]. The important role of mathematics is relevant to aspects of life, such as calculating and measuring. This shows that mathematical concepts are used in everyday life. The formulation of Mathematics learning objectives according to the Ministry of Education and Culture [6], namely reasoning about patterns and properties, generalizing Mathematical operations, and creating and compiling Mathematical evidence, ideas and statements. This makes Mathematics an eye-catching lesson that needs to be given at each level of education so that students can have and apply mathematical thinking patterns in everyday life and become a reference for studying various other branches of science.

Mathematical objects have different characteristics from other subjects, which are basically

abstract [7]. An example of mathematical abstraction is the presence of symbols. Few students experience learning difficulties in areas closely related to these numbers [8]. The problem is that mathematics has the characteristic of having objects Whose nature is abstract, which can cause many students to have difficulty learning mathematics. Students experience difficulty when changing word problems into mathematical models [9]. Difficulty in study is caused by learning obstacles, so students cannot achieve their goals, which can be overcome with more active efforts [10].

Mathematics learning objectives can be seen from success or failure in understanding concepts and their application in everyday life. Hence, evaluations or tests on learning outcomes need to be carried out. Based on evaluations and tests, learning results can be seen to what extent the learning process was successful and where students made mistakes in solving questions. There are two types of errors, namely those that are systematic and those that are consistent, influenced by student competence. In contrast, those that are incidental are not influenced by student competency [11]. Mistakes are a normal thing for students to do. However, if errors are made frequently and persistently, immediate special intervention is necessary to prevent adverse student effects.

Remember that mathematical material is interconnected with subsequent material. Understanding previously learned concepts is crucial, as it forms the foundation for grasping more advanced concepts [12]. According to Radatz, student mistakes result from learning experiences in previous material [13]. Similarly, [14] found that one of the reasons for student errors in solving problems is the lack of understanding of basic concepts from previous material. Every student solving a mathematics problem must go through five steps: reading, understanding, transformation, Skills process, and determining the final answer [15].

One possible theory used in analyzing student errors in solving problems is the theory put forward by Kastolan. Based on Kastolan Theory, students make three types of errors in solving questions: conceptual, procedural, and technical errors [16]. These difficulties ultimately cause students to make mistakes when working on mathematics problems. In general, the mistakes are that students cannot understand the questions well, students do not understand the concepts used in the questions, and students make mistakes in calculating the answers. As well as students' low understanding and creativity in identifying real problems in mathematical models. Most students make mistakes in the three aspects mentioned by Kastolan, but some students make mistakes because they are lazy. For example, lazy count, lazy to read questions, lazy to do questions, etc. This laziness mostly starts from students who don't understand the concepts in the chapter taught. According to Istiyanto in Uni (2009), mistakes are frequent when solving mathematics problems. What is done is that students only memorize mathematical questions and formulas instead of practicing mathematical problems.

Students' difficulties in working on questions are caused by various factors, such as Good factors from the self or outside oneself [17]. Internal factors can be a lack of motivation, students' lack of interest in the material, students' lack of talent in learning mathematics, patterns that students already think mathematics is difficult and so on [18]. External factors are usually the learning environment conditions, lazy friends, family support and others [19]. Students who make mistakes when working on questions can also be an indication of how far students have mastered the material. Difficulties experienced by students can happen Because students do not master the concept of logarithms [20].

Logarithms are one of the mathematical materials studied in schools at the SMA/MA/SMK level. Logarithms are the inverse operation of exponent numbers. Logarithms play an important role

in everyday life because they can help calculate the Richter scale to measure the strength of an earthquake [21]. However, in reality, many students still experience difficulties in learning logarithms [22]. Logarithm material was chosen for this research because logarithms have properties that students must understand so that they can easily find mistakes made by students. The material on logarithms, introduced in Grade 10 of high school, is new to students as it was not covered in junior high school. Not understanding the nature of logarithms is included in the incomprehension draft. A problem must be resolved with at least one property in one logarithm. In most logarithms, problems are resolved with more than one trait. As previously explained, students' errors in solving logarithm problems need to be analyzed so that at that time, students will no longer make mistakes in solving logarithm problems.

Based on previous research regarding errors in the problem-solving process based on the Kastolan procedure carried out by Supita, Nuryani & Istiqomah [23] stated that students still have difficulty in developing a resolution strategy due to confusion in applying the concepts to be used and inaccuracy student in do the questions. In line with research by Ulfa & Kartini [24], students still make mistakes in solving logarithm material questions, including conceptual, procedural, and technical errors. The mistakes in solving mathematical problems must be paid attention to [25]. Suppose students continue to make mistakes when solving problems. In that case, massive handling is needed so that it does not have a bad impact on students and that students do not continue to make mistakes when solving logarithmic questions [15]. Students' errors need to be analyzed to determine what types of errors students make. This analysis can reveal where the errors are, and educators can adjust appropriate learning for students so they do not repeat mistakes in solving questions. Based on the explanation above, researchers are encouraged to research vocational school students' analysis errors in solving logarithm problems based on the Kastolan procedure.

METHODS

The research method applied is descriptive qualitative, which analyzes students' mistakes in completing question logarithms. The research subjects were nine students of Class X IT Vocational School. The error analysis used in this research uses the Kastolan error stages. Identifying mistakes made by students is done by looking at the completion steps. So, indicators are needed to make it easier to identify these errors. The error indicators that the researcher created are in accordance with Kastolan's analysis. These indicators are presented in Table 1 below:

Table 1. Indicator Kastolan's mistake

No	Error Type	Error Indicator
1	Conceptual Error	• Unable to interpret/use questions and a term, concept, and principle • Cannot choose the logarithm formula/property correctly • Cannot apply the logarithm formula/property correctly
2	Procedural Error	• Inappropriate steps in solving the ordered questions • Unable to solve the problem in its simplest form
3	Technical Error	• Making errors in calculation operations • Making mistakes in moving numbers or arithmetic operations from one step to the next

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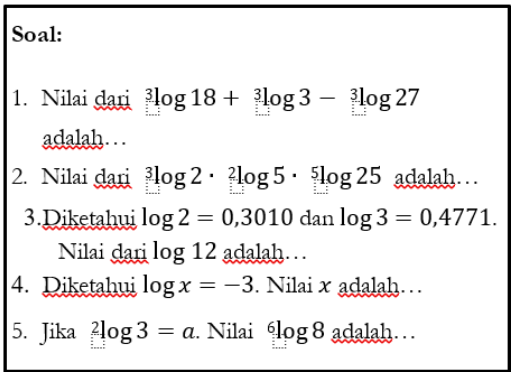
Techniques used in collecting data on study This consists of 1) A written test carried out during the research by giving questions in the form of descriptions to students after previously receiving material on logarithms, 2) Documentation of the results of students' answers. The next stage of data reduction is to choose results from a number of students representing all three types of errors based on procedure Kastolan then analyzed and then described the results of several students' answers to conclude the types of errors made. The description question instruments used in the research are as follows:


Soal:

1. Nilai dari ${}^{3}\log 18 + {}^{3}\log 3 - {}^{3}\log 27$ adalah…
2. Nilai dari ${}^{3}\log 2 \cdot {}^{2}\log 5 \cdot {}^{5}\log 25$ adalah…
3. Diketahui $\log 2 = 0{,}3010$ dan $\log 3 = 0{,}4771$. Nilai dari $\log 12$ adalah…
4. Diketahui $\log x = -3$. Nilai x adalah…
5. Jika ${}^{2}\log 3 = a$. Nilai ${}^{6}\log 8$ adalah…

Figure 1. Instrument of Test

The written description test results are processed using a percentage formula based on Arikunto [4] with the following conditions.

$$P = \frac{n}{N} \times 100\%$$

Description

P : Percentage category error

n : Total of each error

N : Total of all errors

Table 2. Category Percentage Error Student

Percentage	Category
$0\% \leq P \leq 20\%$	Very Low
$20\% \leq P \leq 40\%$	Low
$40\% \leq P \leq 60\%$	Moderate
$60\% \leq P \leq 80\%$	High
$80\% \leq P \leq 100\%$	Very High

RESULTS AND DISCUSSION

Researchers conducting this research intend to analyze students' errors in solving logarithm problems using 5 test instrument item descriptions for nine SMK class X TI students. The research results obtained from students' written test answers contained several errors that students made based on the Kastolan procedure.

Table 3. Percentage Error Student

	Type of Errors					Total	Percentage	Category
	1	2	3	4	5			
Conceptual	7	3	3	5	8	26	37	Low
Procedural	6	3	3	5	8	25	36	Low
Technique	3	4	6	3	3	19	27	Low
Total Entire Error						70		

In the percentage data above, there are categories of errors based on the Kastolan procedure that students carry out, including conceptual errors generally caused by students not being able to determine and apply the correct concept of logarithm properties so that students make mistakes in which properties should be used. No. The data processing results show that KK has the largest percentage, 37 %, with a low error category.

Next is Procedural Error (KP). KP is an error related to the steps used in the problem-solving process. The inability to manipulate the completion steps results in inaccurate answers, not checking the work steps again, and not being careful when working, which must be noticed to get the right answer. The results of KP calculations based on the students' written answers contain a percentage of 36 %, which falls into the low error category.

A technical error is a mistake when calculating the value that solves a problem. This type of engineering error earns a certain percentage of 27 % by loading the low error category. Calculating marks in solving questions must be careful and thorough, avoiding inaccuracies or errors. Students obtaining the results of arithmetic operations will result in incorrect calculations, so students' answers to the questions being worked on will be incorrect.

The results of the research show that in many class questions 1 and 4, students made conceptual errors because they did not understand the questions given and could not choose and apply the concept of logarithmic properties correctly. Examples of students' Conceptual Errors (KK) in pictures 2 and 3.

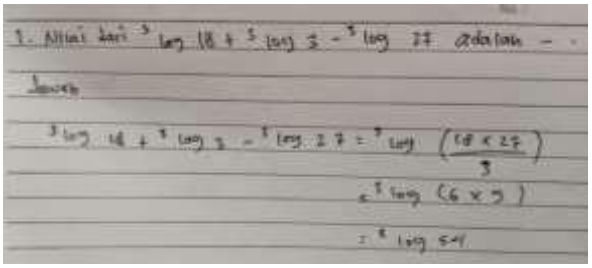


Figure 2. Example of Student's Conceptual Error in Question 1

Figure 2 contains the results of the student's answer: the error made when applying the properties of the logarithm used. The results of students' work on question number 1 were in applying the concept of logarithmic properties incorrectly, so the results obtained an incorrect answer value. Students should understand and apply draft characteristics. ${}^{a}\log b + {}^{a}\log c = {}^{a}\log (b \times c)$ and properties of ${}^{a}\log b - {}^{a}\log c = {}^{a}\log \frac{b}{c}$. When finished, a problem is given so the student can get the right answer. This is in line with research by Natsir, Tandiayuk, & Karniman (2016) that causes conceptual errors; namely, students do not deepen the concept of the material and make mistakes in applying the correct characteristics to answer questions.

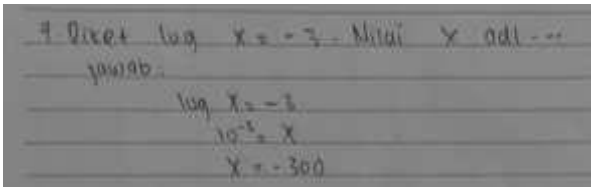


Figure 3. Example of Student's Conceptual Error in Question 4

In Figure 3, students write how to change from logarithmic to exponential forms. However, in the process, the students misunderstood the concept of calculating results from form written

exponent so that that answer produced no appropriate should mark x, which obtained $\frac{1}{1000}$. This shows students do not yet completely understand draft material. As is the idea of Cahyani & Sutriyono [26] mastering the material and not understanding the basic concepts of the material being studied.

In number 5, the student made a procedural error in which the student could work on the problem. Still, during the process, the student became confused when determining the next solution step, so the student could not solve the given problem. Until the solution ends, the results of the students' answers become incorrect. An example of procedural error can be seen in Figure 4.

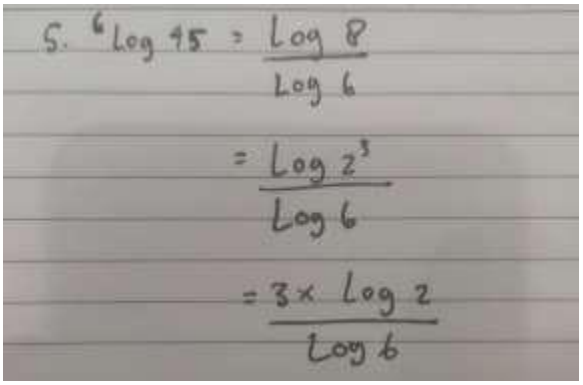


Figure 4. Example of Student's Conceptual Error in Question 5

In Figure 4, it can be seen that students are confused about taking the next solution steps, so they do not completely solve problem number 5 until they get the final solution. Still, there is a step that must be done, and that is to apply characteristics. $^b\log a = \frac{^p\log a}{^p\log b}$ dan $^a\log b = \frac{1}{^b\log a}$. With that, the cause of conceptual errors is that students are not yet capable. Thus, the lack of completion steps causes the answer to be incomplete and appropriate. Based on research by [27] states that students' procedural errors are a lack of knowledge in carrying out the steps in a problem so that the answer results lead to an incomplete solution.

In questions 2 and 3, students were able to apply the concept of logarithm properties, which were appropriate for solving the problems, but there were technical errors, such as students lacked the skills and accuracy in calculating values. So, that results in incorrect answers. The following are examples of Technical Errors presented in Figures 5 and 6.

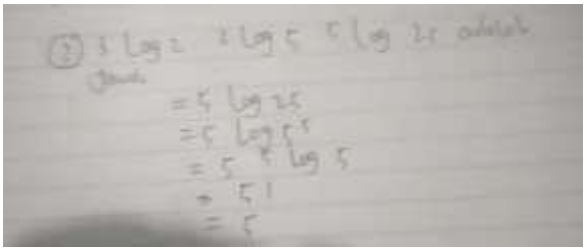


Figure 5. Example of Student's Technical Error in Question 5

In Figure 5, the results of the answers that students have worked on show that students are capable of controlling operation multiplication. Logarithms use properties $^a\log b \cdot {}^b\log c = {}^a\log c$ and $^a\log b^n = n \cdot {}^a\log b$.

However, students are wrong in converting numbers to exponential form. Students misinterpret the result to the power of 25, which should be 5 2, not 5 5, so the answers that students

get are wrong. One case is because of a lack of student accuracy when doing calculations and processing results, which students already do [28].

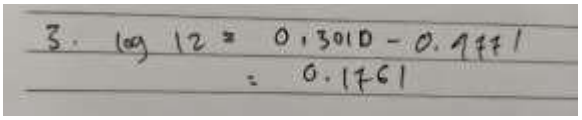


Figure 6. Example of Student's Technical Error in Question 3

In Figure 6, the student was not careful in writing the information on the question, but instead, the student directly entered the log value. It should have been better to write the explanation of the question. The student made that error when calculating the value in decimal form, so the resulting answer is not correct. The answer should be 1.0791, not as written by the student, namely 0.1761. This error is an error when calculating the value of arithmetic operations. According to the ideas of [29], technical errors are caused by errors in calculations, including addition, subtraction, division and multiplication operations.

CONCLUSIONS AND SUGGESTIONS

Based on the findings of this study, it can be concluded that conceptual, procedural, and technical errors made by students in solving logarithmic problems are significant, with conceptual errors being the most dominant. This indicates a need for enhanced understanding of logarithmic concepts and properties. Procedural and technical skills also require attention to reduce mistakes in calculations and problem-solving processes.

To address these issues, it is recommended to develop more effective teaching methods that clearly explain logarithmic concepts, ensure students understand each step in the problem-solving process, and improve students' precision in calculations. Teachers could employ various approaches such as problem-based learning, group discussions, and the use of visual aids to help students better grasp logarithmic concepts. Moreover, providing frequent practice and constructive feedback can assist students in identifying and correcting their errors. The implementation of innovative and interactive learning strategies could enhance students' abilities in solving logarithmic problems and decrease the frequency of errors they commit.

REFERENCE

[1] H. Pashler *et al.*, *Organizing Instruction and Study to Improve Student Learning*. 2012.
[2] R. N. Auliya, "Kecemasan Matematika dan Pemahaman Matematis," *Form. J. Ilm. Pendidik. MIPA*, vol. 6, no. 1, pp. 12–22, 2016, doi: 10.30998/formatif.v6i1.748.
[3] A. Arseven, "Mathematical Modelling Approach in Mathematics Education," *Univers. J. Educ. Res.*, vol. 3, no. 12, pp. 973–980, 2015, doi: 10.13189/ujer.2015.031204.
[4] N. Fitriyah, C. M. Pertiwi, and A. Yuliani, "Analisis kesalahan siswa SMK dalam menyelesaikan soal materi logaritma berdasarkan prosedur kastolan," *Pembelajaran Mat. Inov.*, vol. 4, no. 5, pp. 1141–1148, 2022, doi: 10.22460/jpmi.v5i4.1141-1148.
[5] S. Danim, *Pengembangan Profesi Guru*. Prenada Media, 2012.
[6] C. M. Pertiwi, R. A. Jayanti, and M. Afrilianto, "Asosiasi Antara Kemampuan Generalisasi Matematik Dengan Self-Concept Siswa Smp Yang Menggunakan Strategi Pembelajaran Berbasis Vba Microsoft Excel," *JPMI (Jurnal Pembelajaran Mat. Inov.*, vol. 1, no. 3, p. 371, 2018, doi: 10.22460/jpmi.v1i3.p371-382.
[7] R. N. Basuki and S. Chotimah, "Analisis Keesalahan Siswa Smp Kelas VIII Dalam

Menyelesaikan Soal Perbandingan," *JPMI (Jurnal Pembelajaran Mat. Inov.*, vol. 4, no. 3, pp. 691–698, 2021, doi: 10.22460/jpmi.v4i3.691-698.

[8] D. Hamidah, R. I. I. Putri, and S. Somakim, "Eksplorasi Pemahaman Siswa pada Materi Perbandingan Senilai Menggunakan Konteks Cerita di SMP," *J. Ris. Pendidik. dan Inov. Pembelajaran Mat.*, vol. 1, no. 1, p. 1, 2018, doi: 10.26740/jrpipm.v1n1.p1-10.

[9] Y. Atiqa and Kusrini, "Pengaruh Pembelajaran Matematika Realistik Terhadap Memori Siswa Pada Sub Materi Perbandingan Senilai Dan Beralik Nilai Di Kelas VII SMPN 5 Tuban," *MATHEdunesa*, vol. 2, no. 1, pp. 1–7, 2013.

[10] Mulyadi, "Diagnosis Kesulitan Belajar Di Sekolah," *J. Tarb. Al-Awlad*, vol. 8, no. 1, pp. 18–23, 2018.

[11] A. M.Faizal, "Analisis Kesalahan Mahasiswa PGSD Universitas Muhammadiyah Sidoarji dalam Mneyelesaikan Soal Pertidaksamaan Linier," *J. Edukasi*, vol. 1, no. 2, pp. 131–145, 2015.

[12] T. Solfitri, Kartini, H. M. Siregar, and R. Syari, "The Analysis of Students' Errors in Using Integration Techniques," in *Proceeding of the SS9 & 3rd URICES, 2019, Pekanbaru, Indonesia*, 2019, pp. 328–335.

[13] L. J. Blanco and M. Garrote, "Difficulties in learning inequalities in students of the first year of pre-university education in Spain," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 3, no. 3, pp. 221–229, 2007, doi: 10.12973/ejmste/75401.

[14] H. M. Siregar, "Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Tes Kemampuan Berpikir Kreatif Matematis Materi Lingkaran," *AKSIOMA J. Progr. Stud. Pendidik. Mat.*, vol. 8, no. 3, pp. 497–507, 2019, doi: 10.24127/ajpm.v8i3.2379.

[15] O. F. I. Hananta and N. Ratu, "Analisis Kesalahan Siswa dalam Menyelesaikan Soal Logaritma," *JPMI (Jurnal Pendidik. Mat. Indones.*, vol. 4, no. 1, p. 29, 2019, doi: 10.26737/jpmi.v4i1.900.

[16] W. A. Najwa, "Analisis Kesalahan Siswa dalam Menyelesaikan Penjumlahan Bilangan Bulat Berdasarkan Teori Kastolan," *J. Sekol. Dasar*, vol. 6, no. 1, pp. 77–83, 2021, doi: 10.36805/jurnalsekolahdasar.v6i1.1288.

[17] F. Jamal, "Analisis Kesulitan Belajar Siswa Pada Materi Peluang | 18," *J. MAJU (Jurnal Pendidik. Mat.*, vol. 1, no. 1, pp. 18–36, 2014.

[18] A. D. Raharti and T. N. H. Yunianta, "Identifikasi Kesalahan Matematika Siswa SMP Berdasarkan Tahapan Kastolan," *J. Honai Math*, vol. 3, no. 1, pp. 77–100, 2020.

[19] N. Kurniawati and A. M. Rohmah, "Berdasarkan Teori Polya," vol. 4, no. 1, pp. 31–35, 2021.

[20] U. Pawestri, I. Kurniawati, M. Prodi, P. Matematika, D. Prodi, and P. Matematika, "12347874," vol. 1, no. 1, pp. 1–7, 2013.

[21] A. A. Supardi, Y. Gusmania, and F. Amelia, "Pengembangan Modul Pembelajaran Matematika Berbasis Pendekatan Konstruktivisme Pada Materi Logaritma Pendahuluan Salah satu mata pelajaran yang sangat penting di dunia pendidikan yakni matematika , dimana matematika merupakan ilmu yang bersifat universal," *J. Mat. dan Pendidik. Mat.*, vol. 10, no. 1, pp. 80–92, 2019.

[22] I. N. Hayati and B. Budiyono, "Analisis Kesulitan Siswa Sma Negeri 1 Kedungwuni Materi Logaritma," *J. Math. Math. Educ.*, vol. 8, no. 2, pp. 115–124, 2018, doi: 10.20961/jmme.v8i2.25844.

[23] S. Supita, L. Z. Nuryani, and I. Istiqomah, "Analisis Kesalahan Menyelesaikan Soal Uraian Matematika Materi Logaritma Kelas X SMK," *UNION J. Ilm. Pendidik. Mat.*, vol. 8, no. 1, pp. 41–51, 2020, doi: 10.30738/union.v8i1.7610.

[24] D. Ulfa and K. Kartini, "Analisis Kesalahan Siswa dalam Menyelesaikan Soal Logaritma Menggunakan Tahapan Kesalahan Kastolan," *J. Cendekia J. Pendidik. Mat.*, vol. 5, no. 1, pp. 542–550, 2021, doi: 10.31004/cendekia.v5i1.507.

[25] N. Munawaroh, E. E. Rohaeti, and U. Aripin, "Analisis Kesalahan Siswa Berdasarkan Kategori Kesalahan Menurut Watson dalam Menyelesaikan Soal Komunikasi Matematis Siwa SMP," *JPMI (Jurnal Pembelajaran Mat. Inov.*, vol. 1, no. 5, p. 993, 2018, doi: 10.22460/jpmi.v1i5.p993-

1004.
[26] C. Aditya Cahyani and S. Sutriyono, "Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Pada Materi Operasi Penjumlahan dan Pengurangan Bentuk Aljabar Bagi Siswa Kelas VII SMP Kristen 2 Salatiga," *JTAM | J. Teor. dan Apl. Mat.*, vol. 2, no. 1, p. 26, 2018, doi: 10.31764/jtam.v2i1.257.
[27] R. Lefrida, "Bentuk Aljabar Di Smp Negeri 7 Palu," 2004.
[28] M. Toha, A. Mirza, and D. Ahmad, "Analisis Kesalahan Siswa Dalam Menyelesaikan Soal Cerita Materi Perbandingan Di Kelas Vii Smp," *JPPK J. Pendidik. dan Pembelajaran Khatulistiwa* , vol. 7, no. 1, pp. 1–10, 2018.
[29] L. Lutfia and L. Sylviana Zanthy, "Analisis Kesalahan Menurut Tahapan Kastolan Dan Pemberian Scaffolding Dalam Menyelesaikan Soal Sistem Persamaan Linear Dua Variabel," *J. Educ.*, vol. 1, no. 03, pp. 396–303, 2019.

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