

## Analysis Of Students' Errors In Solving Mathematics Problems In Algebra Shape

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### Abstract

This study aims to describe the mistakes of class VII students of SMP Negeri 1 Tondano in solving questions on the Algebraic Forms material in the bold and alluring learning process. The errors referred to here may occur in solving Algebra Form problems, including principle and concept errors. The type of research used is descriptive research with a qualitative approach. Data collection techniques are carried out through tests, interviews, and documentation. The sources and subjects of this study were class VII students of SMP Negeri 1 Tondano T/A 2020/2021 and T/A 2022/2023, who were selected based on considerations. Data analysis techniques in this study are the stages of data reduction, data presentation, and conclusions. The results of this study indicate that the mistakes made by students are: 1) conceptual errors, where they cannot identify elements in the algebraic form, such as terms, variables, coefficients, and constants. 2) the principle of error, where it is wrong to operate algebraic forms that have negative terms, and errors in determining operations on terms that are not similar. The causal factors in brave learning are: 1) working on questions in a hurry; 2) do not understand the concept in Algebraic Forms; 3) do not know how to operate tribes that are not of the same type; 4) do not know the correct settlement calculation operating procedure; 5) not careful in working on the questions; 6) ambient distractions that make it out of focus. The causal factors in engaging learning are: 1) Class conditions are not conducive; 2) decreased student discipline.

**Keywords:** Error, Algebraic Forms, Online, Offline

### Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kesalahan-kesalahan siswa kelas VII SMP Negeri 1 Tondano dalam menyelesaikan soal materi Bentuk Aljabar dalam proses pembelajaran daring dan luring. Kesalahan yang dimaksudkan disini adalah kesalahan yang mungkin terjadi dalam menyelesaikan soal Bentuk Aljabar, meliputi: kesalahan prinsip, dan kesalahan konsep. Jenis penelitian yang digunakan adalah penelitian deskriptif dengan pendekatan kualitatif. Teknik pengumpulan data yang dilakukan, yaitu dengan melalui tes dan wawancara, serta dokumentasi. Sumber dan subjek penelitian ini adalah siswa kelas VII SMP Negeri 1 Tondano T/A 2020/2021 dan T/A 2022/2023 yang dipilih berdasarkan pertimbangan. Teknik analisis data dalam penelitian ini yaitu dengan tahapan reduksi data, penyajian data, kesimpulan. Hasil dari penelitian ini menunjukkan bahwa kesalahan yang dilakukan siswa adalah: 1) kesalahan konsep, dimana tidak bisa mengidentifikasi unsur-unsur dalam bentuk aljabar seperti suku sejenis, variabel, koefisien, dan konstanta. 2) kesalahan prinsip, dimana salah dalam pengoperasian bentuk aljabar yang memiliki suku yang bernilai negatif, dan kesalahan dalam menentukan operasi suku yang tidak sejenis. Faktor penyebab dalam pembelajaran daring yaitu: 1) mengerjakan soal secara terburu-buru; 2) tidak memahami konsep dalam Bentuk Aljabar; 3) tidak tahu mengoperasikan suku yang tidak sejenis; 4) tidak tahu prosedur operasi perhitungan bilangan yang benar; 5) tidak teliti dalam mengerjakan soal; 6) gangguan sekitar yang membuat tidak fokus. Faktor penyebab dalam pembelajaran luring yaitu: 1) Kondisi kelas yang tidak kondusif; 2) kedisiplinan siswa yang menurun.

**Kata kunci:** Kesalahan, Bentuk Aljabar, Daring, Luring

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## INTRODUCTION

Mathematics is one of the compulsory subjects taught at every level of formal education, from elementary, junior high, high school, and vocational school to the tertiary level. Mathematics is essential in solving daily human life problems (Siagian, 2016; Mangelep, 2017; Runtu et al., 2023).

The benefits of mathematics in human life include training patience, accuracy, thoroughness, ways of thinking, basic knowledge, self-discipline, and helping to trade (Mangelep, 2017; Manambing et al., 2018; Cindy, 2022). Therefore, mathematics is fundamental and valuable in student life.

Mathematics is often considered a complicated subject in the eyes of students. So that many students think that mathematics is considered a complex, complicated, and deceptive science (Mangelep et al., 2013; Dewi et al., 2022). These statements also align with the many efforts and methods to improve education quality in Indonesia. However, they are aware of various problems in learning, especially with the emergence of the COVID-19 pandemic, which greatly affected students' interest in learning. Students felt bored because they did not meet their friends and teachers in person (Mangelep, 2015; Yunitasari & Hanifah, 2020).

One of the problems in education that can be seen is the mistakes made by students in solving the problems that have been given, especially in mathematics. Mathematics lessons have many topics and sub-topics that must be learned (Sulistyaningsih & Mangelep, 2019; Tiwow et al., 2022). Therefore, in studying mathematics, it is necessary to understand the basics before being able to move on to the following material because if a student does not understand the basics of mathematics, then he will also experience errors in subsequent materials (Sulistyaningsih et al., 2018; Mangelep et al., 2020).

In learning activities carried out online, many students need to be more disciplined in time, so they are not optimal in understanding the material. Regarding the presentation of mathematics material, the teacher stated that from the results of the midterm exams for class VII students for the 2020/2021 school year, students often made mistakes in questions of Algebraic Forms, there were approximately 64% or 78 students out of 121 students who often made mistakes in answering questions, and there were 19% of students or as many as 23 students who did not reach the KKM Mathematics which at that time was at number 77 in that school year. In the 2022/2023 academic year, the Mathematics KKM was 78, up one point from the previous academic years. On the results of student daily exam tests in Algebraic Forms, as many as 63 students out of 92 students scored below the KKM.

According to Utami (2020), difficulties that often occur in students' self-ability when studying online from home are 1) students cannot yet have the initiative to study on their own, so students wait for instructions or assignments from the teacher first in learning, 2) students have not can manage learning activities from home so that they only study material as needed which is limited to what the teacher has given, 3) student learning targets are only limited to getting satisfactory grades, not on abilities they can acquire and improve, 4) there are still students who give up in doing assignments because they encounter difficulties, 5) students rarely evaluate the process of their learning outcomes.

Then after the end of the pandemic period, students returned to carrying out learning activities at school, Istiqomah (Istiqomah, 2022) stated that the implementation of post-covid-19 learning was not yet conducive and caused the quality of learning and student discipline to decrease. Meanwhile,

mistakes have occurred since the online era and have continued post-pandemic (Amalia & Kadar, 2021; Kartika & Hanifatulianti, 2022; Tiwow et al., 2022).

Based on the description above, many students still experience difficulties that cause errors in solving Algebraic Forms problems and have yet to achieve the expected results. Therefore, research must further reveal student errors and their causes in learning Algebraic Forms material.

## METHOD

This research is descriptive research with a qualitative approach. This research was carried out in class VII of SMP Negeri 1 Tondano in the 2020/2021 school year and in class VII of SMP Negeri 1 Tondano in the even semester of the 2022/2023 school year. The subjects of this research were class VII students of SMP Negeri 1 Tondano. Because it is necessary to carry out research intensively and to streamline time, the cases in this study are limited, so six students from each class are selected by the researcher who participates in this study. The six students are two students with upper ability, two with medium ability, and two with lower ability.

The data collection techniques used in this study were: 1) Test, containing essay questions on Algebraic Forms to identify the mistakes made; 2) Interview, to explore different student mistakes in solving Algebra Form questions related to principles and concepts; 3) Documentation, in the form of photos of the test results of students who will be interviewed, photo documentation of interviews and research implementation.

In this study, the data analysis technique used was descriptive qualitative with the following stages: 1) Data reduction, including Correcting by scoring test results done by students and then conducting interviews with several students who had been selected as research subjects; 2) Presentation of data includes: Presentation of data on student test results, then presenting the results of interviews that have been conducted; 3) Conclude by comparing test results and the results of student interviews to find out where the error lies and what causes the error.

## RESULT AND DISCUSSION

Based on the results of the tests that have been carried out, data is obtained related to the analysis of student error tests in online learning and the analysis of student error tests in offline learning. Tables 1 and 2 below present related data.

Table 1. Results of Analysis of Student Error Tests in Online Learning

No. Problem	Level Errors	Type of Student Ability		
		High	Medium	Low
1a	Error identifying variables	A1, C2, D2	A3, A4, B3, C4, C5	A5, A6, B6, D5, D6
1b	Error identifying coefficients	A1, B2, D2	A3, B3, C5	A5, A6, B6, D5, D6
1c	Error identifying constants	B2, C2, D2	A3, B3, B4	A6, B6, D5, D6

1d	Error identifying like terms	B2, C1, C2	A3, A4, B3, C4, D4	A6, B6, D5, D6
2	Error operating addition	C1, C2	A3, A4, B2, C3, D3, D4	A5, A6, B6, D5, D6
3	Error operating subtraction	A1, A2, B2, C2, D2	A3, A4, B3, C4, D3	A6, B6, C5, D5, D6
4	Error operating multiplication	A1, A2, C2, D2	A3, B3	A5, A6, B5, B6, D5, D6
5	Error operating division	A1, B2, C1, C2, D2	A4, B3, D4	A5, B6, C5, D5, D6
6a	Error operating word problems	A1, B1, B2, C2, D1, D2	A3, B3, C4, D4	A5, A6, B6, C5, C6, D5, D6
6b	Error solving word problems	A1, B2, C1, C2, D2	B3, B4, C3, C4, D3	A5, A6, B5, B6, C5, C6, D5, D6

Keterangan: Siswa kelas A : A1-A6

Siswa Kelas B : B1-B6

Siswa Kelas C : C1-C6

Siswa Kelas D : D1-D6

Table 2. Results of Student Test Error Analysis in Offline Learning

No. Problem	Level Errors	Types of Student Ability		
		High	Medium	Low
1a	Error identifying variables	A2, C1	B2, B3, C3	A5, A6, B6, C6
1b	Error identifying the coefficients	A2, C1	B2, B3, C3	A5, A6, B6, C6
1c	Error identifying constants	C1	B3, B4	A5, A6, B6, C6
1d	Error identifying like terms	A2, B1	B3, B4	A5, A6, B6, C5
2	Error operating addition	A2, B1, B2, C1	B3, B4, C3	A5, A6, B6, C6
3	Error operating subtraction	A2, B1, B2, C1	B3, B4, C3	A5, A6, B6, C6
4	Error operating multiplication	A1, A2, B1, B2, C1	A3, B3, B4, C3	A5, A6, B6, C6
5	Error operating division	A1, A2, B1, B2, C1	A3, B3, B4, C3	A5, A6, B6, C5, C6
6a	Error solving word problems	A2, B2, C1	B3, B4, C4	A5, A6, B6, D6
6b	Error solving word problems	A1, A2, B2, C1	A3, B3, B4, C3	A5, A6, B6, C6

Description: Grade A students: A1-A6

Class B Students: B1-B6

Class C Students: C1-C6

Table 3 below shows the analysis results regarding what factors caused students to make mistakes in completing the test questions.

Table 3. Factors Causing All Students' Errors

<b>Errors in solving questions</b>	<b>Factors that cause errors</b>
Misidentified variable	Don't understand the definition of variable
Error identifying the coefficients	Don't understand the definition of the coefficients
Error identifying constants	Don't understand the definition of constants
Misidentification of same-sex ethnicity	Not understanding the definition of like-ethnicity
Error operating addition	Not understanding the concept of operation addition
Error operating subtraction	Not understanding the concept of subtracting integers on negative terms
Error operating multiplication	Not understanding the distributive concept of multiplication
Error operating division	Not understanding the concept of division operations
Error solving word problems	Unable to present in Algebraic Form

The data from this research that will be discussed are student errors in solving questions on algebraic material and the factors that cause errors in solving algebraic material problems.

From the results of tests and interviews during the pandemic, it can be seen that students experienced errors in solving algebraic questions, one of which was that students still had difficulty identifying variables, coefficients, constants, and similar terms in question number 1. This was because students needed to learn the definition of variables, such as subjects. A5, with the excuse that he had forgotten, so he estimated the definition of the variable by looking at another question where it was written 'x and y variables,' so he answered incorrectly. Subject D4 needs to understand the definition of the coefficient. Subject D4 thinks that coefficients are all numbers that have letters in an algebraic form. Subject C2 does not know a coefficient, so he guesses that the first number in an algebraic form is the coefficient. Meanwhile, subject C2 did not know what like terms were, so he rewrote the coefficients and variables. According to Cooney's opinion in Yusmin (2017), students' difficulties in expressing concepts are partly due to the inability to state the meaning of terms that represent certain concepts, causing students to make mistakes.

Subject A4 needed to understand the concept of addition operations and the concept of variables so that students added up the numbers without paying attention to variables. Subject A2 understood how to perform subtraction operations but was not thorough in understanding the questions and was wrong in operating terms with negative values because students did not master the concept of addition operations on integers. Subject C4 incorrectly applied arithmetic operations in the multiplication of algebraic forms because students thought that they had to operate only like terms in the multiplication of algebraic forms. In subject A4, the students misremembered the operating principle in the division operation, so they applied the multiplication operation in the division operation. Subject A5 was able to present the problem in Algebraic Form, but in its completion,

students needed to be more careful in solving the problem resulting in wrong answers. Then for solving problems in Algebraic Form operations, subject C4 needed to be more careful in understanding and solving problems. Students should have made better calculations due to the rush to solve the problems given in a limited time. There were also distractions during online learning, where the surrounding environment could have been more relaxed, resulting in a lack of concentration. The subject realized and tried to resolve the problem and improve the calculation process.

Then, from the results of post-pandemic tests and interviews, it can be seen that students still need to improve in solving algebraic questions. Namely, there are still many difficulties in identifying variables, coefficients, constants, and similar terms in question number 1. Subject A5 does not understand the concept of variables, coefficients, constants, as well as similar terms with the excuse of forgetting so that they answer the test at random. Carrying out addition operations in algebraic forms is also a difficulty for students, namely in terms of positive and negative values that make students make operational errors such as those carried out by subject B4 because students do not master the concept of addition operations on integers.

Students also need help to perform subtraction operations on algebraic forms on terms with positive and negative values. This is because students do not master the concept of subtraction in integers. Students also make multiplication errors, namely because students need to learn the procedure. As a result, subject B1 does what is in brackets first, even though the term in brackets is non-similar. This shows that students do not know the concept of different terms. Subject C5 made an operating error in the division operation because he did not know how to carry out the procedure, so he only divided the numbers without paying attention to the existing variables. Then, Subject B2 already understands the basic concepts in Algebraic Form and can present problems, but students need help understanding addition operations. Then for solving problems in Algebraic Form operations, subject B2 did not need help understanding that in solving the problem, students made wrong calculations. Some subjects complained that the class conditions were not calm, which made it difficult to concentrate on the questions. This was in line with the conditions during the test where the class was often not conducive, and the teacher had often reprimanded, but the same thing happened many times, students tended not to listen to the teacher's reprimands.

It can be seen that students still experience errors in solving questions on algebraic material, both from students with high abilities, moderate abilities, and low abilities. These errors are related to concepts and principles in algebraic forms and the causative factors because students do not master the concepts and principles in algebraic forms and other factors in online and offline learning which affect students in solving algebraic questions.

## **CONCLUSION**

Based on the results of the analysis of the tests and the results of the analysis on the interviews that were carried out with class VII students at SMP Negeri 1 Tondano, it can be concluded

that: (1) The mistakes made by class VII students at SMP Negeri 1 Tondano in solving questions on the material algebraic forms, namely: 1) conceptual errors, where students cannot identify elements in the algebraic form such as like terms, variables, coefficients, and constants because students often forget the definitions of variables, coefficients, or constants. 2) In principle errors, students make mistakes in operating algebraic forms with negative terms and errors in determining operations on terms that are not the same type. (2) The factors that caused class VII students of SMP Negeri 1 Tondano to make mistakes in solving questions on algebraic material in the COVID-19 era, namely: 1) working on problems in a hurry; 2) do not understand the concept in Algebraic Forms; 3) do not know how to operate tribes that are not of the same type; 4) do not know the correct number calculation operation procedure; 5) not careful in working on the questions; 6) ambient distractions that make it out of focus. The causal factors in offline learning are 1) Class conditions that are not conducive; 2) decreased student discipline.

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