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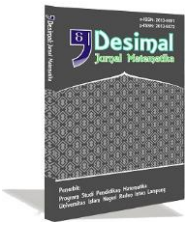

Students' errors in solving HOTS mathematics problems based on newman's theory in view of learning independence

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ABSTRACT

Mathematics plays a crucial role in developing students' cognitive skills, particularly at the junior high school level. One type of question commonly used in assessments is the Higher Order Thinking Skills (HOTS) question, which requires students to think critically, creatively, and analytically. However, many students still struggle with solving HOTS questions, often due to insufficient understanding of basic concepts, difficulties in applying those concepts, and low levels of self-directed learning. This study aims to provide an overview of student errors in solving HOTS problems based on Newman Theory in terms of learning independence. The method used in this research is a descriptive qualitative approach that worked on HOTS questions. Data were collected through tests, interviews, and self-directed learning questionnaires. The findings indicate that students' errors are largely related to challenges in concept mastery (K1), problem-solving strategies (K2), and a lack of independence in learning. Moreover, students with higher levels of self-directed learning performed better in solving HOTS questions. Based on these findings, it is recommended that educators implement teaching strategies that enhance students' self-directed learning, such as problem-solving activities and regular HOTS practice, to reduce errors in solving questions that require higher-level cognitive skills.

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INTRODUCTION

Mathematics is one of the subjects that is considered important in learning at the primary to secondary education level. Success in mastering mathematics lies not only in the ability to count or understand basic concepts but also in the ability of students to think critically and analytically (Anugrah & Pujiastuti, 2020). This is especially important given that many of the exam questions faced by students are more complex and challenging. One of the types of questions that are often tested in exams is Higher Order Thinking Skills (HOTS) type questions. HOTS questions

are designed to measure students' ability to think at a higher level, not just memorize formulas or procedures (N. K. Safitri, Wulandari, & Putri, 2023). However, solving these HOTS-type problems is often a big challenge for students, because in addition to requiring a deep understanding of concepts, these problems also test creativity, problem-solving skills, and the application of mathematical concepts..

In general, HOTS questions are designed to assess students' cognitive skills at a higher level than questions that only test basic understanding and application skills (Suryanti, Sari, & Kristiani, 2020). In this case, HOTS questions require students to not only know how to calculate or apply formulas but also to analyze, evaluate, and create new solutions to the given problem. HOTS problem types often involve the application of mathematical concepts in real-world or unusual situations, requiring students to think outside the box. Therefore, to be able to solve this type of problem correctly, students must have strong critical and analytical thinking skills, as well as the ability to connect various mathematical concepts that have been learned (Anwariyah & Nurhanurawati, 2023).

However, it is not uncommon for students to make mistakes when working on HOTS questions. This error can occur due to various factors, both in terms of understanding the concept and skills in applying the concept, and psychological factors such as anxiety or rushing in solving problems (Hartini & Setyaningsih, 2023). One common error that often occurs is the inability to identify the right steps in solving problems. Many students are stuck in a simple mindset, focusing on familiar procedures or formulas, and are less open to other possibilities in problem-solving. This often causes them to be unable to find the right solution even though they have a good understanding of basic mathematical concepts (Rahmadhani & Hilliyani, 2023).

In addition, many students are not familiar with questions that contain ambiguity or uncertainty, which often appear in HOTS questions. These kinds of problems require students to be able to think critically and make the right assumptions before proceeding further in problem solving (Khusna, Utami, & Nursyahidah, 2021). When faced with problems that require them to make decisions or analyses based on incomplete information, many students have difficulty, as they are used to more structured and straightforward problems. As a result, they often make mistakes in interpreting questions or even get caught up in misleading or confusing clues (Mutmainnah, Sadaruddin, Mariyani, & Pratiwi, 2021).

Another factor that causes errors in solving HOTS problems is the lack of practice or experience in dealing with similar problems. As is known, the more often someone practices or is exposed to a type of problem, the more likely they are to master the right strategy for solving the problem (Fathiyah, 2020). However, in mathematics education, especially in countries where the curriculum focuses on teaching the basics and applying formulas, students often rarely get the opportunity to practice HOTS problems. This leaves them unprepared for this type of question on the exam and thus at risk of making mistakes that could have been avoided with enough practice (Anwariyah & Nurhanurawati, 2023).

In addition, psychological factors also play a role in HOTS problem-solving errors. Many students feel depressed or anxious when facing exam questions, especially questions that are considered difficult. This tension or anxiety can interfere with their ability to think clearly and solve problems well. Anxiety can affect memory, concentration, and the ability to perform in-depth analysis, all of

which are very important in solving HOTS questions. When students are rushed in trying to find answers or fearful of mistakes, they are more likely to overlook proper solution steps or not check their work carefully (N. K. Safitri et al., 2023).

Some errors occurred due to a misunderstanding of the question format. In HOTS questions, there are often more complex instructions or more information to consider than in other types of questions. Students who are used to more direct problems that do not require in-depth analysis may find it difficult to understand what is being asked in the problem (Ratri & Azhar, 2022). They may overlook some important information or not understand what the problem is based on, so the resulting answer is not as desired. This error in understanding or ambiguity of the question is often one of the main causes of failure in solving HOTS questions.

It is undeniable that the skills needed to solve HOTS questions are very different from other types of questions. Therefore, it is important for educators to provide a more holistic approach in teaching mathematical concepts, not only relying on memorizing formulas or procedural steps (Febryana, Sudiana, & Pamungkas, 2023). Learning that encourages students to think critically, develop creativity, and be able to connect various mathematical concepts is very important in preparing them to face HOTS questions. In addition, it is also important for students to practice HOTS problems regularly, understand the types of problems that may arise, and develop more flexible and effective problem-solving strategies (Amalia & Hadi, 2020).

By understanding the causes of errors in solving HOTS problems, it is hoped that educators and students can take more appropriate steps to improve their ability to deal with this type of problem. Improving the quality of mathematics education that emphasizes the development of critical and analytical thinking skills will help students not only in facing exams but also in facing real-life challenges that require the ability to solve problems effectively and efficiently (Anggraeni, Sumandya, & Surat, 2023).

Research related to errors in solving HOTS-type mathematics problems among junior high school students shows that the main problem that is often faced is the high number of errors made by students in various stages of problem-solving. These errors include reading errors (K1), understanding errors (K2), problem transformation errors (K3), process skills errors (K4), and final answer writing errors (K5). This phenomenon indicates significant difficulties in implementing Higher Order Thinking Skills (HOTS), which require students to think critically, creatively, and analytically. Often, the main factors influencing these errors are the lack of deep understanding of the material and students' low learning independence, which impacts their ability to overcome the challenges that arise in HOTS questions. Therefore, the purpose of this study is to analyze the types of errors that are often made by students in solving HOTS problems and to assess the extent to which learning independence affects students' ability to overcome these errors. This research also aims to provide practical recommendations that can help educators in improving the quality of mathematics learning, especially in mathematical problem-solving..

Teachers' efforts in developing questions are expected to encourage the improvement of higher-order thinking skills (HOTS), increase creativity, and build students' independence to solve problems. The low level of mathematical literacy skills is not only caused by the infrequent use of questions that refer to comprehension skills but also due to low student independence in learning (Kholifasari, Utami, & Mariyam, 2020). In fact, problem exercises in the form of

literacy are able to encourage student innovation and creativity in solving problems (Ariyanto, Muqtafia, Fahma, Nurviyani, & Purwaningrum, 2022).

Independence is the ability of individuals to direct and control themselves in thinking and acting and not feel dependent on others. Learning independence shows the readiness of an individual to determine whether or not the individual is able to determine his learning strategy (Kholifasari et al., 2020). In the process of developing student independence, it can be achieved with the help of teachers in the mathematics learning process (Muna, Ulya, & Kudus, 2022). However, at this time teachers only transfer knowledge, not how to educate students (Ahyani, Pramono, Astuti, Kawuryan, & Purwaningrum, 2019). So that student activity or participation in learning is low (R. D. Safitri, Safrudiannur, & Azainil, 2024).

However, the research gap is the lack of studies that directly connect the level of student learning independence with the types of errors that occur in solving HOTS problems. Most of the previous studies focused more on the aspects of concept mastery or the application of learning strategies without considering how much the role of self-directed learning is in influencing student learning outcomes, especially in solving problems that require higher-level thinking. This suggests a lack of understanding of how students' internal factors, such as self-reliance, can affect their performance in HOTS-based examinations. The urgency of this research is very high because, in the era of education that increasingly emphasizes critical thinking and problem-solving-based learning, it is very important to understand the factors that influence student errors in solving cognitively challenging problems. By knowing the role of learning autonomy, educators can design more effective teaching strategies, help students develop learning autonomy, and improve their ability to solve HOTS problems better.

METHOD

This type of research is descriptive qualitative research. This research will present some of the data collected to analyze errors in problem-solving according to Newman's theory on HOTS-type questions. The purpose of this study is to directly describe the location of students' errors in solving HOTS-type problems according to Newman's theory and their causes. The most important part of research is the flow of thought framework so that this writing is directed and can achieve the desired target. The framework of the flow of thought is made in the research flow chart, which can be seen in Figure 1.

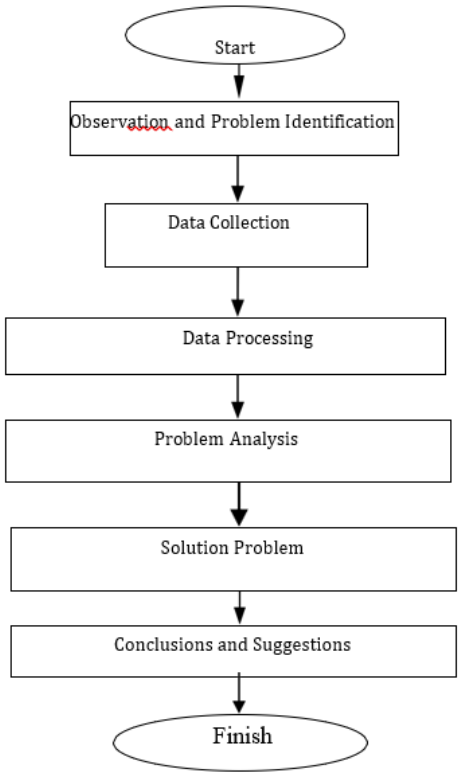

Figure 1. Research Flow Chart

This research was conducted at Muhammadiyah 3 Karangpandan Junior High School located in Doplang, Karangpandan District, Karanganyar Regency, Central Java, with the number of

students in class VIII B as many as 20 students. In this study, error indicators according to Newman's theory (Fatmawati & Nasution, 2024).

Table 1. Newman's Theory Error Indicators

No.	Error Type	Indicator
1.	Reading Error	Students cannot read words, math symbols, or important information in the problem. Students misread important information in the problem.
2.	Comprehension Error	Students do not know the information known and asked about the problem. Students misunderstand the information known and asked about the problem.
3.	Transformation Error	Students cannot convert the information in the problem into a mathematical model. Students are wrong in choosing the method, formula, or operation used to solve the problem.
4.	Process Skill Error	Students are wrong in using mathematical rules in solving problems. Students cannot continue the solution process.
5.	Encoding Error	Students do not write the answer or conclusion as requested by the question. Students are less precise in writing answers and conclusions.

Based on Table 1, the following is a recapitulation of the five categories of student errors according to the types of errors made, namely K1 (concept reading error), K2 (problem understanding error), K3 (problem transformation error), K4 (process skill error), and K5 (final answer writing error).

Table 2. Errors by Type (K1-K5)

Question	K1	K2	K3	K4	K5
1	8	7	0	0	0
2	6	2	0	3	7
3	14	17	17	17	17

Based on Table 2, the distribution of students' errors in each type of error varies for each problem. The score categories, divided into three parts, namely high, medium, and low, provide an overview of the extent to which students master the material and their ability to deal with HOTS questions.

Table 3. Categories Based on Score

Value	Categories	Number of Students
71 – 100	High	3
60 – 70	Medium	5
0 – 59	Low	12

In this study, the collected data will be examined using the data triangulation technique to test the validity of the data by combining various data collection techniques and existing data sources (Kemendikbud, 2018). The data analysis technique used in this research is an analysis technique consisting of three stages, namely data reduction, data presentation, and conclusion drawing. Before the researchers conducted the expert verification process. Mathematics Education lecturers carried out the expert verification process. Until the statement instrument was obtained as follows:

Problem number 1

Two friends, Rina and Rini, went to a thrift store. Rina bought 4 clothes with a total price of Rp. 150,000. Of this amount, Rina bought 2 shirts and 2 pants, while Rini bought 3 clothes for Rp. 100,000, consisting of 1 shirt and 2 pants.

From the story, determine:

a. How much do one shirt and one pair of pants cost?

b. The two of them plan to go shopping again next time, buying 2 shirts and 1 pair of pants each. If the prices of the shirts and pants do not change, what is the minimum total cost they should prepare?

Problem number 2

In Solo City, two tourist attractions are being visited, Solo Safari and Museum

Batik Danar Hadi; they sell tickets with the following package prices:
- Solo Safari sells tickets for 3 adults and 2 children with a total price of Rp. 185,000.
- Museum Batik Danar Hadi sells tickets for 2 adults and 4 children for a total price of Rp. 190,000.
Question:
a. Make a system of equations from the information above!
b. Calculate the price of one ticket for adults and one ticket for children!
c. If a family wants to buy 2 adult tickets and 3 children's tickets, what is the total cost they have to prepare?

Problem number 3
Every day, we often encounter various situations involving calculations or comparisons that can be solved using the system of linear equations of two variables (SPLDV). An example that often occurs in everyday life is the purchase of goods. Create a problem about the System of Linear Equations of Two Variables (SPLDV) that is related to everyday life.
- Describe the situation or context of the problem.
- Create two equations that describe the situation.
- Make sure the problem is challenging and can be solved using the methods you have learned.

RESULTS AND DISCUSSION

Based on the research instrument used. The following is an analysis of errors in solving HOTS-type math problems based on Newman's theory in terms of the independence of junior high school students.

Data Analysis of Subject S1 High Category

The results of S1's answers to questions number 1, 2, and 3 are shown below.

Answer to question number 1

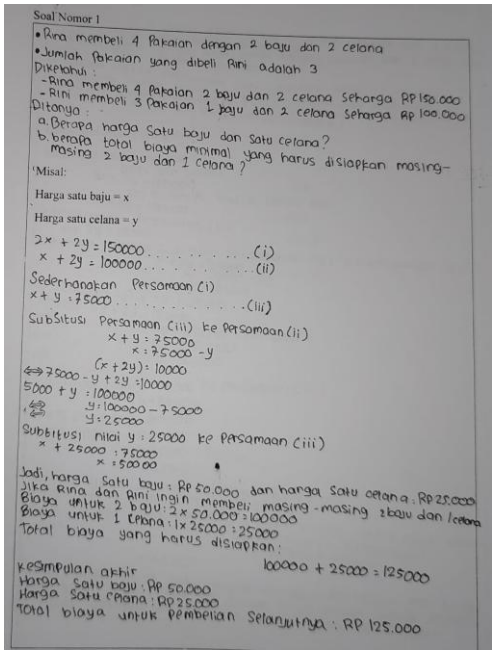
Soal Nomor 1
•Rina membeli 4 pakaian dengan 2 baju dan 2 celana
•Jumlah pakaian yang dibeli Rini adalah 3
Diketahui :
- Rina membeli 4 pakaian 2 baju dan 2 celana seharga Rp 150.000
- Rini membeli 3 pakaian 1 baju dan 2 celana seharga Rp 100.000
Ditanya :
a. Berapa harga satu baju dan satu celana?
b. berapa total biaya minimal yang harus disiapkan masing-masing 2 baju dan 1 celana?
Misal:
Harga satu baju = x
Harga satu celana = y
2x + 2y = 150000 ..... (i)
x + 2y = 100000 ..... (ii)
Sederhanakan Persamaan (i)
x + y = 75000 ..... (iii)
Subsitusi Persamaan (iii) ke Persamaan (ii)
x + y = 75000
x = 75000 - y
(x + 2y) = 10000
75000 - y + 2y = 10000
5000 + y = 100000
y = 100000 - 75000
y = 25000
Subsitusi nilai y = 25000 ke Persamaan (iii)
x + 25000 = 75000
x = 50000
Jadi, harga satu baju : Rp 50.000 dan harga satu celana : Rp 25.000
Jika Rina dan Rini ingin membeli masing-masing 2 baju dan 1 celana
Biaya untuk 2 baju : 2 x 50.000 = 100000
Biaya untuk 1 celana : 1 x 25000 = 25000
Total biaya yang harus disiapkan :
100000 + 25000 = 125000
Kesimpulan akhir
Harga satu baju : Rp 50.000
Harga satu celana : Rp 25.000
Total biaya untuk pembelian selanjutnya : Rp 125.000

Figure 2. Answer to Question Number 1

Based on Figure 2, subject S1 can only present a statement. The following interview results reinforce this statement.
P: "What do you know from question number 1?"
S1: "Problem number 1 is known: Rina bought 4 clothes, 2 shirts, and 2 pants for Rp. 150,000, and Rini bought 3 clothes, 1 shirt, and 2 pants for Rp. 100,000. Determine the price of one shirt and one pair of pants, the total minimum cost that must be prepared is two shirts and one pair of pants, respectively."
P: "Then what is the next step to solve the problem?"
S1: "First, I find the equation of what is known from the problem."
P: "How do you get the answer to the problem?"
S1: "I substitute the equation to get the values $y = 25{,}000$ *and* $x = 50{,}000$*."*
P: "Then what is the conclusion of the problem?"
S1: "The conclusion is that the price of one shirt is Rp. 50,000 and the price of one pair of pants is Rp. 25,000."

So it can be concluded that subject S1 has types of reading errors, comprehension errors, transformation errors, skill errors, and errors in writing

the final answer to problem number 1. Subject S1 understands and understands the meaning of the problem in working on HOTS-type math problems based on Newman's theory.

Answer to question number 2

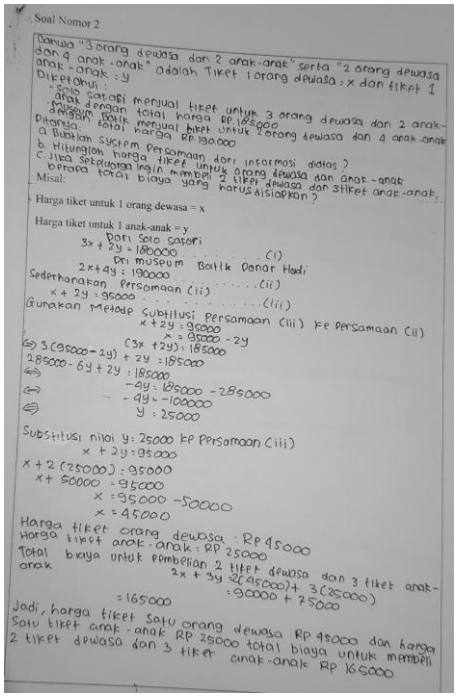

Figure 3. Answer to Question Number 2

Based on Figure 3, subject S1 can only present a statement. The following interview results reinforce this statement.

P: "What do you know from question number 2?"

S1: "Problem number 2 is known: Solo Safari sells tickets for 3 adults and 2 children with a total price of Rp. 185,000; Museum Batik Danar Hadi sells tickets for 2 adults and 4 children with a total price of Rp. 190,000. Determine the system of equations from the information, ticket prices for adults and children, and the total cost prepared if a family wants to buy 2 adult tickets and 3 children's tickets."

P: "Then what is the next step to solve the problem?"

S1: "First, I find the equation of what is known from the problem."

P: "How do you get the answer to the problem?"

S1: "I substitute the equation to get the values $y = 25{,}000$ and $x = 45{,}000$."

P: "Then what is the conclusion of the problem?"

S1: "The conclusion is that the price of one adult ticket is Rp. 45,000 and the price of one child ticket is Rp. 25,000."

So it can be concluded that subject S1 has types of reading errors, comprehension errors, transformation errors, skill errors, and final answer writing errors in problem number 2. Subject S1 understands working on HOTS-type math problems based on Newman's theory.

Answer to question number 3

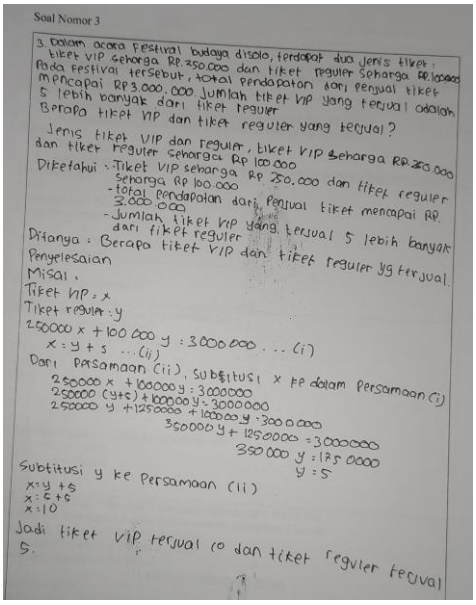

Figure 4. Answer to Question Number 3

Based on Figure 4, subject S1 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 3?"

S1: "Statement number 3 makes the question, namely, it is known that VIP tickets cost Rp. 250,000 and regular tickets cost Rp. 100,000, the total income from ticket sellers reaches Rp. 3,000,000, and the number of VIP tickets sold is 5 more than regular tickets, determining VIP tickets and regular tickets sold."

P: "Then what are the next steps to work on the problem?"
S1: "First, I look for similarities from what is known from the problem."
P: "How can I get the answer to the question?"
S1: "I substitute from the equation obtained to produce the value of $y = 5$ *and* $x = 10$*."*
P: "Then what is the conclusion of the question?"
S1: "The conclusion is $x = 10$ *and* $y = 5$*."*

So it can be concluded that subject S1 had types of reading errors, comprehension errors, transformation errors, skill errors, and errors in writing the final answer to question number 3. Subject S1 understands working on HOTS-type math problems based on Newman's theory, but in the conclusion, there is nothing.

Data Analysis of Subject S2 Medium Category

The results of S2's answers to questions number 1, 2, and 3 are shown below.

Answer to question number 1

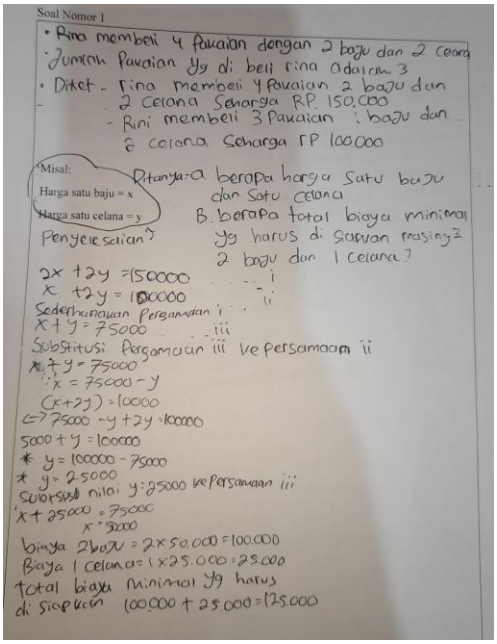

Figure 5. Answer to Question Number 1

Based on Figure 5, subject S2 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 1?"
S2: "Question number 1 is known: Rina bought 4 clothes, 2 shirts, and 2 pants for Rp. 150,000, and Rini bought 3 clothes, 1 shirt, and 2 pants for Rp. 100,000. Determine the price of one shirt and one pair of pants; the total minimum cost that must be prepared is two shirts and one pair of pants each."
P: "Then what are the next steps to work on the question?"
S2: "I look for the equation from what is known from the question."
P: "How can I get the answer to the question?"
S2: "I substitute from the equation."
P: "Then what is the conclusion of the question?"
S2: "I did not write the conclusion of the question."

So, it can be concluded that subject S2 has the type of reading error, understanding error, transformation error, skill error, and error in writing the final answer on question number 1. Subject S2 understands how to do math problems but is lacking in solving the problem in writing the final answer.

Answer to question number 2

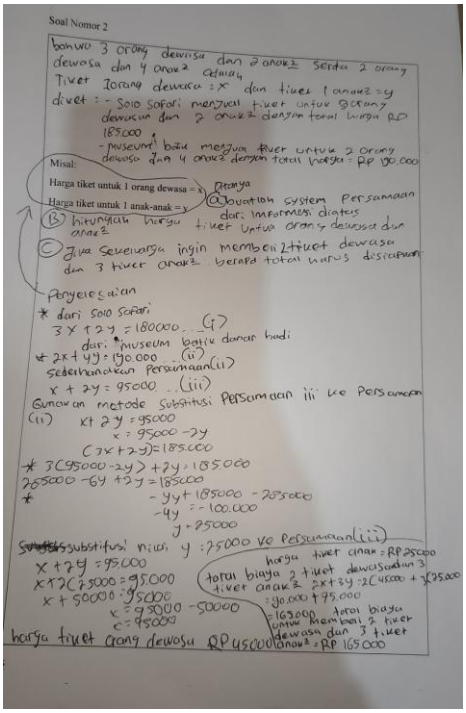

Figure 6. Answer to Question Number 2

Based on Figure 6, subject S2 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 2?"

S2: "In question number 2, it is known that Solo Safari sells tickets for 3 adults and 2 children with a total price of Rp. 185,000, and the Batik Museum sells tickets for 2 adults and 4 children for a total price of Rp. 190,000. Determine the system of equations from the information, ticket prices for adults and children, and the total cost prepared if a family wants to buy 2 adult tickets and 3 children's tickets."

P: "Then what are the next steps to work on the problem?"

S2: "I look for an equation from what is known from the problem."

P: "How can I get the answer to the problem?"

S2: "I substitute from the equation obtained to produce the value $y = 25{,}000$ *and* $x = 45{,}000$*."*

P: "Then what is the conclusion of the problem?"

S2: "In conclusion, the ticket price for one adult is Rp. 45,000, and the ticket price for one child is Rp. 25,000."

So, it can be concluded that subject S2 has the types of reading errors, understanding errors, transformation errors, skill errors, and errors in writing the final answer to question number 2. Subject S2 understands how to work on HOTS-type math problems based on Newman's theory.

Answer to question number 3

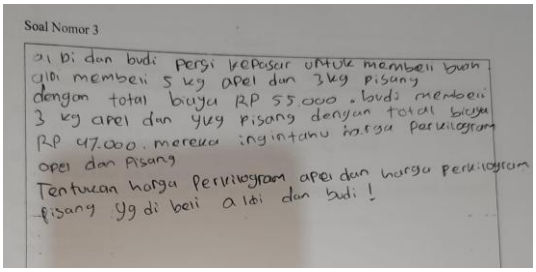

Figure 7. Answer to Question Number 3

Based on Figure 7, subject S2 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 3?"

S2: "Statement number 3 makes the question: Aldi and Budi go to the market to buy fruit. Aldi buys 5 kg of apples and 3 kg of bananas with a total cost of Rp. 55,000. Budi buys 3 kg of apples and 4 kg of bananas with a total cost of Rp. 47,000. They want to know the price per kilogram of apples and bananas. Determine the price per kilogram of apples and the price per kilogram of bananas purchased by Aldi and Budi."

P: "Then what are the next steps to work on the question?"

S2: "I have difficulty in determining the next step."

So, it can be concluded that subject S2 with the type of reading error already understands the intent of question number 3, but in understanding errors, transformation errors, skill errors, and errors in writing the final answer to question number 3, subject S2 has

difficulty in determining the next step because he does not understand the concept applied to the question.

Data Analysis of Subject S3 Low Category

The results of S3's answers to questions number 1, 2, and 3 are shown below.

Answer to question number 1

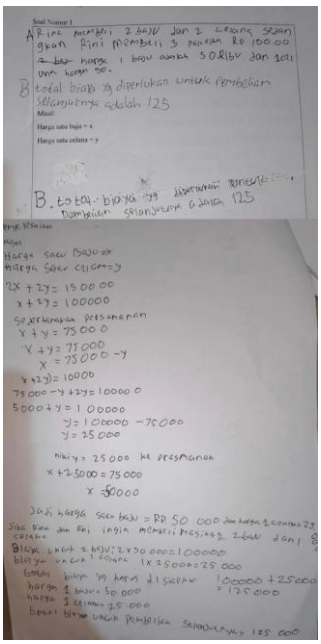

Figure 8. Answer to Question Number 1

Based on Figure 8, subject S3 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 1?"

S3: "Rina bought 2 shirts and 2 pants, while Rini bought 3 clothes for Rp. 100,000. The price of 1 shirt is Rp. 50,000, and 1 pair of pants costs Rp. 50,000. The total cost required for the next purchase is Rp. 125,000."

P: "Then what are the next steps to work on the problem?"

S3: "I look for the equation from what is known from the problem."

P: "How can I get the answer to the problem?"

S3: "I substitute from the equation."

P: "Then what is the conclusion of the problem?"

S3: "The price of one shirt is Rp 50,000, and the price of one pair of pants is Rp 25,000."

So, it can be concluded that subject S3 with the type of reading error and understanding error in question number 1 subject 3 can be seen that most students identify the errors they make in the math exam related to understanding or applying concepts that have not been fully mastered. Transformation errors, skill errors, and errors in writing the final answer in question number 1. Subject S3 understands how to work on the problem.

Answer to question number 2

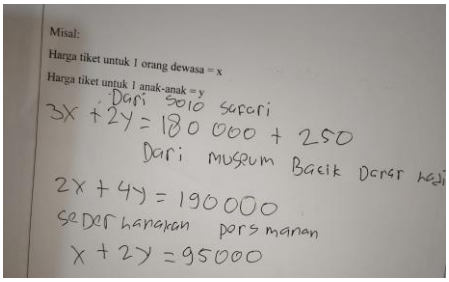

Figure 9. Answer to Question Number 2

Based on Figure 9, subject S3 can only present a statement. The following interview results strengthen the statement.

P: "What do you know from question number 2?"

S3: "In Solo City, there are two tourist attractions that are currently popular, namely Solo Safari and the Danar Hadi Batik Museum; they sell tickets with the following package prices:

Solo Safari sells tickets for 3 adults and 2 children with a total price of Rp. 185,000. The Danar Hadi Batik Museum sells tickets for 2 adults and 4 children with a total price of Rp. 190,000.

Question: The system of equations from the information above, the price of one ticket for adults and one ticket for children, if one family wants to buy 2 adult tickets and 3 children's tickets, how much total cost do they have to prepare?"

P: "Then what are the next steps to work on the problem?"
S3: "I look for equations from what is known from the problem."
P: "How can I get the answer to the problem?"
S3: "I am still confused about the next step."

So it can be concluded that subject S3 with the type of reading error and understanding error in question number 2 can be seen that the understanding or application of the concept has not been fully mastered. Errors in understanding transformation in determining several equations. Errors in skills and errors in writing the final answer in question number 2 Subject S3 is confused in determining the next step.

Answer to question number 3

The following interview results of subject S3 strengthen this statement.

P: "What do you know from question number 3?"
S3: "Creating questions and solutions."
P: "Then what are the next steps to work on the question?"
S3: "I don't understand the basic concept clearly, and I'm confused about how to work on more complicated questions."

So, it can be concluded that subject S3 with the type of reading errors and understanding errors, transformation errors, skill errors, and errors in writing the final answer on question number 3 realized that he had difficulty in applying the concepts he had learned to more complex questions. So for number 3, he did not do it.

These interviews provide a clear picture of the challenges students face in working on math test questions. Incomprehension of concepts, confusion in choosing the right steps or methods, difficulty in applying concepts to complex situations, lack of accuracy, and difficulty in choosing the correct strategy were the main factors influencing students' errors. A deeper understanding of these key areas of error can help develop more effective teaching strategies that can help students overcome these difficulties.

In the research that the researchers conducted, informants who had high category scores made mistakes at the final answer writing stage. The results of this study are supported by research conducted by Setiawan & Jusniani (2021), which states that students who have high problem-solving abilities make errors when doing the final writing or in providing conclusions on the calculations performed. The cause of the error was due to lack of accuracy due to not being accustomed to writing the conclusion of the final answer when solving the trigonometric story problem given. Students who have a high level of ability tend to make mistakes when writing the final answer because they are not accustomed to writing conclusions based on the story problems given.

In the research that the researchers conducted, informants who had medium category scores made mistakes at the process skills stage and writing the final answer due to lack of skill and accuracy when solving the given story problems. Subjects who have a moderate level of ability in solving story problems of the three-variable linear equation system can conclude that subjects tend to make mistakes at the process skills stage and writing the final answer. Students who have a moderate level of ability tend to make mistakes in process skills because they are less careful in calculating and make mistakes in the final answer writing stage because students are less careful and not used to writing conclusions based on the story problems given.

In the research that the researchers conducted, informants who had low category scores made mistakes at the stages of reading questions, transformation, process skills, and writing the final answer. The results of this study are supported by research by Jun, Hariyani, & Murniasih (2022), which

states that low-ability students make mistakes in reading (readings), comprehension errors (comprehensions), transformation errors (transformations), process skills errors (process skills), and errors in writing the final answer (encodings). These errors were caused by a lack of understanding of the material, a lack of skills and accuracy in the calculation process, and not writing the final answer when solving the trigonometric story problems given. That they made mistakes in the stage of changing the problem because they did not write the mathematical model that would be used to solve the problem due to lack of understanding of the material, mistakes in the process skills stage because they did not understand what method to use in solving the problem in the story problem, and also could not complete the calculation process because they did not understand the problem in the problem. And errors in writing the final answer because they are not accustomed to making conclusions from the story problems given due to a lack of understanding of the material.

CONCLUSIONS AND SUGGESTIONS

Based on the results of this study, it can be concluded that the errors made by students in solving HOTS (Higher Order Thinking Skills) type mathematics problems are mostly caused by low levels of learning independence, lack of understanding of basic concepts, and unpreparedness in facing more complex and challenging problems. Students who have high learning independence tend to be better able to manage their time and learning resources, reflect on learning outcomes, and overcome challenges in HOTS problems better. In contrast, less independent students are more likely to rush to find answers without conducting in-depth analysis and often feel anxious or insecure when facing problems that require higher-order thinking skills.

It is recommended for educators to introduce learning approaches that prioritize the development of learning independence, provide opportunities for students to practice HOTS questions regularly, and increase students' confidence by creating a supportive learning environment. Educators also need to pay special attention to strengthening the understanding of basic concepts and critical thinking skills, which will equip students to deal with HOTS questions more effectively and efficiently. Thus, developing better learning independence will help students not only in overcoming errors in HOTS questions but also in facing increasingly complex academic and life challenges. The researcher's suggestion related to this study is that Newman's analysis can be applied to find out the mistakes made by students, especially in problem-solving in order to get an appropriate solution. In addition, the researcher also hopes that this research can be a reference for further research by including the right way to overcome student errors by deepening the ability used as a reinforcement of the theory.

REFERENCES

Ahyani, L. N., Pramono, R. B., Astuti, R. D., Kawuryan, F., & Purwaningrum, J. P. (2019). Evaluation of the pelita bullying prevention program: A study of elementary school teachers in kudus, indonesia. *The Open Psychology Journal*, *12*(1), 147–154. https://doi.org/10.2174/1874350101912010147

Amalia, D., & Hadi, W. (2020). Analisis kesalahan siswa dalam menyelesaikan soal hots berdasarkan kemampuan penalaran matematis. *Transformasi : Jurnal Pendidikan Matematika Dan Matematika*, *4*(1), 219–236. https://doi.org/10.36526/tr.v4i1.904

Anggraeni, K. N., Sumandya, I. W., & Surat, I. M. (2023). Analisis jenis kesalahan siswa smp n 1 mengwi dalam menyelesaikan soal matematika tipe hots. *Prosiding SENAMA PGRI*, 1–12.

Anugrah, A., & Pujiastuti, H. (2020). Analisis kesalahan siswa dalam menyelesaikan soal hots bangun ruang sisi lengkung. *Jurnal Pendidikan Matematika*, *11*(2), 213. https://doi.org/10.36709/jpm.v11i2.11897

Anwariyah, F., & Nurhanurawati, N. (2023). Analisis kesalahan siswa dalam menyelesaikan soal hots materi persamaan linier satu variabel ditinjau dari gender. *Mathema: Jurnal Pendidikan Matematika*, *5*(2).

Ariyanto, M. P., Muqtafia, K., Fahma, A. A., Nurviyani, E., & Purwaningrum, J. P. (2022). Pengembangan lks matematika berbasis jepara local wisdom pada materi segi empat dan segitiga sebagai wujud mengimplementasikan kurikulum merdeka. *Prosiding Seminar Nasional Pendidikan Matematika (SNAPMAT)*, *1*(1).

Fathiyah, I. (2020). Analisis kualitatif kesalahan pengerjaan soal matematika tipe hots berdasarkan teori nolting pada siswa SMP. *Universitas Pendidikan Indonesia*.

Fatmawati, D. P., & Nasution, N. B. (2024). Kesalahan dalam menyelesaikan soal cerita berdasarkan teori newman ditinjau dari computational thinking. *Prosiding Diskusi Panel Nasional Pendidikan Matematika*, 239–250.

Febryana, E., Sudiana, R., & Pamungkas, A. S. (2023). Analisis kesalahan siswa dalam menyelesaikan soal matematika bertipe hots berdasarkan teori newman. *SJME (Supremum Journal of Mathematics Education)*, *7*(1), 15–27. https://doi.org/10.35706/sjme.v7i1.6586

Hartini, S. T., & Setyaningsih, R. (2023). Analisis kesalahan siswa dalam menyelesaikan soal geometri bebasis higher order skill (hots) berdasarkan teori newman ditinjau dari gaya belajar siswa. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(1), 932–944. https://doi.org/10.31004/cendekia.v7i1.2230

Jun, V., Hariyani, S., & Murniasih, T. R. (2022). Analisis kesalahan peserta didik dalam penyelesaian soal cerita teorema pythagoras berdasarkan teori newman. *Journal Focus Action of Research Mathematic (Factor M)*, *4*(2), 139–152. https://doi.org/10.30762/factor_m.v4i2.3722

Kemendikbud. (2018). Modul manajemen implementasi kurikulum 2013 jenjang SMK. In *Modul Manajemen Implementasi Kurikulum 2013 Jenjang 2013*.

Kholifasari, R., Utami, C., & Mariyam, M. (2020). Analisis kemampuan literasi matematis siswa ditinjau dari karakter kemandirian belajar materi aljabar. *Jurnal Derivat: Jurnal Matematika Dan Pendidikan Matematika*, *7*(2), 117–125. https://doi.org/10.31316/j.derivat.v7i2.1057

Khusna, A. A., Utami, R. E., & Nursyahidah, F. (2021). Kesalahan siswa dalam menyelesaikan soal sistem persamaan linear dua variabel tipe hots ditinjau dari gaya kognitif di masa pandemi covid-19. *Jurnal Tadris Matematika*, *4*(1), 77–94. https://doi.org/10.21274/jtm.2021.4.1.77-94

Muna, N., Ulya, H., & Kudus, U. M. (2022). *WhatsApp in view of student learning independence*. 218–232.

Mutmainnah, Sadaruddin, Mariyani, & Pratiwi, F. (2021). Analisis kesalahan siswa dalam menyelesaikan soal matematika tipe hots (higher order

thinking skill) menggunakan prosedur newman. *Prosiding Seminar Nasional MIPATI*, *1*(1).

Rahmadhani, E., & Hilliyani. (2023). Kesalahan siswa dalam menyelesaikan soal tipe hots (meta analisis). *Jurnal Pembelajaran Matematika Inovatif*, *6*(4).

Ratri, W. A., & Azhar, E. (2022). Analisis kesalahan siswa dalam menyelesaikan soal tipe hots menggunakan prosedure newman. *Jurnal Pendidikan Tambusai*, *6*(2).

Safitri, N. K., Wulandari, I. G. A. P. A., & Putri, G. A. M. A. (2023). Analisis kesalahan siswa dalam menyelesaikan soal cerita matematika tipe hots materi aljabar berdasarkan teori nolting. *Jurnal Santiaji Pendidikan (JSP)*, *13*(1). https://doi.org/10.36733/jsp.v13i1.6010

Safitri, R. D., Safrudiannur, S., & Azainil, A. (2024). Peningkatan hasil belajar matematika menggunakan model pembelajaran problem based learning dan aplikasi quizizz di kelas vii smp negeri 1 kembang janggut. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *6*(2), 140–148. https://doi.org/10.24176/anargya.v6i2.12021

Setiawan, E., & Jusniani, N. (2021). Analisis kesalahan mahasiswa dalam menyelesaikan soal interpolasi berdasarkan analisis kesalahan newman. *PRISMA*, *10*(2), 221. https://doi.org/10.35194/jp.v10i2.1596

Suryanti, S., Sari, C. Y., & Kristiani, K. (2020). Kesalahan penyelesaian soal statistika tipe high order thinking skills berdasarkan teori newman. *Jurnal Tadris Matematika*, *3*(2), 207–218. https://doi.org/10.21274/jtm.2020.3.2.207-218