Edumatica: Jurnal Pendidikan Matematika
Volume 13 Number 03 December 2023

Submited : 19 June 2023
Revised : 14 November 2023
Accepted : 27 December 2023

Kesalahan Siswa pada Soal Cerita Fungsi Kuadrat Berdasarkan Teori Nolting

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Abstrak

Penelitian ini bertujuan untuk mendiskripsikan jenis-jenis kesalahan yang dilakukan oleh siswa dalam menyelesaikan soal cerita pada materi fungsi kuadrat dan mengetahui faktor penyebabnya. Jenis penelitian yang dilakukan yaitu penelitian deskriptif kualitatif. Penelitian dilakukan disalah satu SMP di Kalimantan Selatan dengan subjek 5 orang siswa kelas IX. Instrumen yang digunakan dalam penelitian adalah soal cerita materi fungsi kuadrat berupa 3 soal esai. Teknik pengumpulan data berasal dari hasil jawaban tes uraian dan wawancara. Keabsahan data yang digunakan peneliti adalah triangulasi teknik yaitu membandingkan hasil tes matematika siswa dengan hasil wawancara. Berdasarkan hasil analisis yang telah dilakukan peneliti, jenis kesalahan yang dilakukan subjek adalah 1) *Misread-direction errors* (30%) siswa tidak membaca petunjuk pada soal dikarenakan terburu-buru dan tidak terbiasa membaca petunjuk soal serta rendahnya penalaran siswa, 2) *Careless errors* (40%) siswa salah dalam melakukan perhitungan dikarenakan kurang teliti, 3) C*onsept errors* (20%) siswa tidak memahami konsep eliminasi dan substitusi dikarenakan kurangnya belajar, 4) *Aplication errors* (33,33%) siswa tidak dapat mengoperasikan konsep eleminasi dan subsitusi dalam menyelesaikan soal dikarenakan kurang memahami materi, 5) *Test-taking errors* (66,67%,) siswa tidak menuliskan kembali informasi pada soal dikarenakan tergesa-gesa dan tidak terbiasa dalam menyelesaikan soal secara sistematis.
Kata Kunci: fungsi kuadrat, kesalahan siswa, soal cerita, teori nolting

Student Errors on Quadratic Function Story Problems Based on The Nolting Theory

Abstract

This research aims to describe students' errors in solving story problems related to quadratic functions and identify the underlying factors causing these errors. The research conducted is qualitative. The study took place in one of the junior high schools in South Kalimantan, involving 5 subjects from Grade IX. The research instrument used was three descriptive story problems—data collection techniques involved analyzing the answers to the descriptive test and conducting interviews. Based on the analysis, the types of errors made by the subject are as follows: 1) Misread-direction errors (30%): Students failed to read the instructions properly due to rushing or being unfamiliar with reading question instructions. 2) Careless errors (40%): Students made calculation mistakes due to lack of attention to detail. 3) Concept errors (20%): Students lacked understanding of quadratic function concepts due to insufficient study. 4) Application errors (33.33%): Students could not apply concepts and formulas effectively in solving problems due to a lack of comprehension of the subject matter. 5) Test-taking errors (66.67%): Students failed to restate information from the problem because of being in a hurry and unfamiliar with solving story problems.

Keywords*: nolting theory; quadratic functions; story problems; student errors*

INTRODUCTION

Mathematics is one of the subjects taught in schools at various levels of education. Mathematics is known as the fundamental science of various fields of knowledge. It is an essential subject for students (Hasibuan, 2018). The importance of learning mathematics is emphasized in schools because it can foster critical, logical, analytical, systematic, accurate, and practical thinking in problem-solving. The purpose of teaching mathematics in schools is to prepare students to use mathematics and mathematical thinking patterns daily, making mathematics essential to learn at every level.

Many students still experience difficulties in solving mathematical problems, leading to errors in their solutions. These errors usually occur because students' ability to solve story problems related to the material is still low. Analyzing these errors means examining and solving the problems or difficulties that arise and is used to identify the causes of students' errors when completing tasks or problems. Therefore, due to various factors that contribute to these errors, a more in-depth analysis is needed to understand them fully (Gulvara et al., 2023). It is supported by research conducted by (Ulpa et al. (2021), who state that error analysis is one of the strategies that can be used to improve students' mistakes when working on math problems. Student error analysis can serve as a means to diagnose errors in the learning process as an initial research stage on the teaching and learning process. From the results of student error analysis, factors that cause students to make mistakes when answering math problems, especially story problems, can be identified (Gulvara et al., 2023).

Story problems are questions presented in a story related to daily life. Story problems are more challenging to solve than problems involving only numbers (Suciati & Wahyuni, 2018), making them more challenging for students to solve (Labibah et al., 2021). To solve a story problem, students need to be able to understand the content of the problem, identify the mathematical objects that need to be solved, apply them to a mathematical model, then select the appropriate arithmetic operation to solve the problem, and finally draw a conclusion (Rahmawati & Permata, 2018). Many students find story problems difficult because they sometimes fail to understand the essence or meaning of the problem, resulting in errors when solving them.

One of the math topics that often uses story problems is the application of quadratic functions. However, many students have difficulty understanding the concepts, principles, skills, and calculations related to quadratic functions when working on problems. According to Priyati & Lygia Mampouw, (2018), students' mistakes in solving quadratic function problems often occur. Students' difficulties in learning quadratic function materials are not only caused by the difficulty level of the material itself but also may be caused by ineffective teaching methods by teachers (Hiltrimartin & Pratiwi, 2019). Therefore, to determine what mistakes students make and the factors that cause them to make mistakes in understanding quadratic function story problems, an analysis of student errors in solving problems needs to be done.

Based on the results of studies, it is evident that students still make many mistakes in solving story problems, especially in mathematics lessons. Most students make errors when translating story problems into mathematical models (Yunia & Zanthy, 2020). In line with Kurniasari et al. (2021), students still make many errors in solving quadratic function problems, including conceptual, procedural, and technical mistakes. Similarly, Resky et al. (2022) indicate that students make errors in solving quadratic equations, which are also related to quadratic functions, due to a lack of understanding of quadratic equations. Based on these research findings, an error analysis is needed.

Several methods can be used to analyze the errors made by students. These methods include Newman, Watson, Clements, Nolting, and Fong (Gulvara et al., 2023). These methods have specific characteristics in exploring student errors, and one of the unique and specific characteristics in analyzing errors is the method developed by Nolting. Nolting (2012) classified six types of errors in taking tests, namely: 1) Misread directions errors, which are errors that occur because students misunderstand the directions, such as misreading instructions or misinterpreting the meaning of the problem; 2) Careless errors, which are errors caused by the carelessness of students, such as making calculation mistakes; 3) Concept errors, which are errors made when students do not understand the concept; 4) Application errors, which are errors made when students know the formula but cannot

 Print ISSN: 2088-2157, Online ISSN: 2580-0779

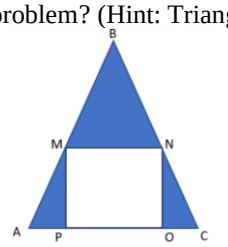
apply it to solve the problem; and 5) Test-taking errors, which are errors caused by specific test-related factors, such as failing to answer a given question.

Therefore, Nolting's theory is suitable for analyzing students' errors in solving quadratic function problems involving story problems. Buton et al. (2023) and Sukmawati & Amelia (2020) state that the Nolting Theory is a theory that explains students' errors in learning mathematics, especially in solving story problems. This study uses Nolting's theory to analyze students' errors in solving quadratic function story problems.

METHOD

This research is a qualitative study. The qualitative method was chosen because the researcher wants to describe and analyze a condition or activity by presenting the data as it is based on facts. This study aims to determine the types of errors students make in solving story problems on quadratic function material and identify the factors that cause students to make those errors. The data comes from the research subjects, 5 ninth-grade junior high school students in Banjarbaru, South Kalimantan. The instrument (Table 1) used in this study is in the form of a test (essay questions).

Table 1. Instrument Test

No.	Question
1.	Mrs. Syifa wants to plan a trip to Loksado Kandangan Waterfall with the students of Permata Middle School using a tourist bus to celebrate the graduation of the 9th-grade students. The fare set by the tourist bus company is IDR. 60,000 per person for 30 passengers or less. However, if the number of passengers exceeds 30, the fare will be reduced by IDR. 2,000 for each additional passenger. For example, if there are 31 passengers, the fare becomes IDR. 58,000. If there are 32 passengers, the fare becomes Rp. 56,000, and so on. Write the quadratic function based on this problem to determine the revenue obtained by the tourist bus company from the passenger fares. (Answer in the form of $f(x) = ax^2 + bx + c$).
2.	Dinda throws a ball vertically upwards. The height of the thrown ball, h (in meters), as a function of time t (in seconds), is given by $h(t) = 30t - 3t^2$. Determine: a. What is the maximum height that the ball can reach? b. Will the ball reach the maximum height at t = 6 seconds?
3.	As shown in the diagram below, Humaira wants to create a wall with a rectangular window. The rectangle MNOP is depicted within the isosceles triangle ABC, with a height of 12 cm and a base of 10 cm. How can we express the quadratic function for this problem to determine the maximum possible area of the rectangular window MNOP and solve the problem? (Hint: Triangle ABC is congruent to triangle MBN). 

The data collection technique used in this study comes from the results of written tests and student interviews. The written test in this study consisted of three essay questions and was given to the five students who were the research subjects. The test consists of story problems on quadratic function material. This test was used to obtain data on the types of errors made by students in solving story problems on quadratic function material based on Nolting's theory. The interview activity was conducted to obtain data and information from the research subjects to identify the factors that cause students to make errors in solving story problems on quadratic function material.

The indicators used by the researcher to analyze and describe the types of errors made by students in solving story problems on quadratic function material are shown in Table 2.

Table 2. Error Type

No.	Error Type	Indicator
1.	*Misread-directions errors* (Mi)	• Students misinterpret the questions. • Students are unable to write down components that are known and asked in questions. • Students do not understand the information in the pictures listed in the questions.
2.	*Careless errors* (Ca)	• Students are careless when working on questions (writing units wrong, writing symbols wrong, and not being careful in arithmetic operations)
3.	*Concept errors* (Co)	• Students do not know the mathematical concepts/principles needed to work on the problems (integer arithmetic operations, the concept of quadratic equations) • Students do not know the concept of algebraic functions.
4.	*Application errors* (Ap)	• Students know the optimum value formulas for quadratic functions but cannot apply them to solve problems in problems.
5.	*Test-taking errors (Te)*	• Students leave answers blank without writing anything down • Students do not complete the answer at the end • Students cannot conclude the final results

RESULTS

The researcher analyzed errors based on Nolting's error indicators (Nolting, 2012) by identifying students' errors in each question. The detailed forms of errors made by students in solving story problems on quadratic function material can be seen in Table 3.

Table 3. Error Type

No.	Error Type		
	Question 1	Question 2	Question 3
S1	Te	-	Te, Co, Ap
S2	Mi, Te	Mi, Ca,	Mi, Ap, Co, Te
S3	Mi, Te	Ca, Te	Ap, Te
S4	Te	Mi, Ca	Te, Co, Ap
S5	Ca, Te	Ca	Ca, Ap

Information:
Mi : Misread-Directions Errors
Ca : Careless Errors
Co : Concept Errors
Ap : Application Errors
Te : Test Taking Errors

Table 4 shows that each student made errors in solving the story problems. The percentage of each type of error made by the students can be seen in Table 4. From Table 4, it is evident that the students' most common type of error is test-taking errors.

 Print ISSN: 2088-2157, Online ISSN: 2580-0779

Table 4. Recapitulation of the Percentage of Student Errors Based on the Nolting Theory

Error Type	Many Students Make Mistakes			Total Error	Error Percentage
	Soal 1	Soal 2	Soal 3		
Misread-Directions	2	2	1	5	30%
Careless	1	4	1	6	40%
Concept	-	-	3	3	20%
Application	-	-	5	5	33,33%
Test Taking	5	1	4	10	66,67%

Information:
Error Percentage: $\frac{Total\ Error}{15} \times 100\%$

Misread-Directions Errors

The percentage of errors in reading the instructions is 30%. An example of a student who made an error in reading the instructions is student 2 (S2). The error can be seen in Figure 1.

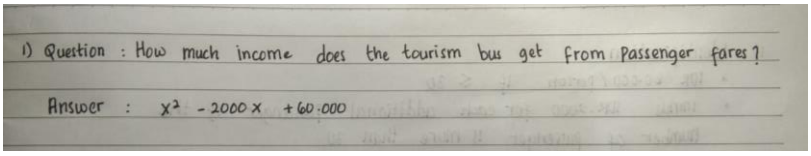


Figure 1. Answer to Question Number 1

The following is an excerpt from an interview with student 2 (S2)

...

A : "Why didn't you write down what was given beforehand? Moreover, only wrote down what was asked?"

S2 : "It is because it was already given in the problem, but I was confused about converting it into a mathematical sentence. I was afraid of being wrong because I was confused about how to write down what was given in the problem. Also, I just wanted to be quick, haha."

A : "Why did you immediately write down the final answer without writing down how you arrived at the answer?"

S2 : "Actually, I was confused about how to answer it because, in the problem, it was given that the cost per person was 60,000, and if the number of passengers increased or decreased by 2000, I just wrote it down as a quadratic equation. Besides, I was in a hurry yesterday, so I did not have time to write down the explanation."

A : "So, your answer is x^2-2000x+60,000, right? Are you sure about your answer?"

S2 : "Yes, I am, but I am not sure because I was confused about how to answer the problem like that."

…

From the tests and interviews above, it can be seen that student 2 (S2) made a mistake in reading instructions. He did not rewrite the information in the problem because he could not translate the information in the picture into sentences and mathematical symbols. In addition, S2 was too hasty in answering the questions, so he decided not to write down the information in the known section and instead wrote down what was asked in the problem. Because of this mistake, the student's answer was incorrect.

Careless Errors

The percentage of careless errors is 40%. An example of a student who made a careless mistake is student 3 (S3). The mistake can be seen in Figure 2.

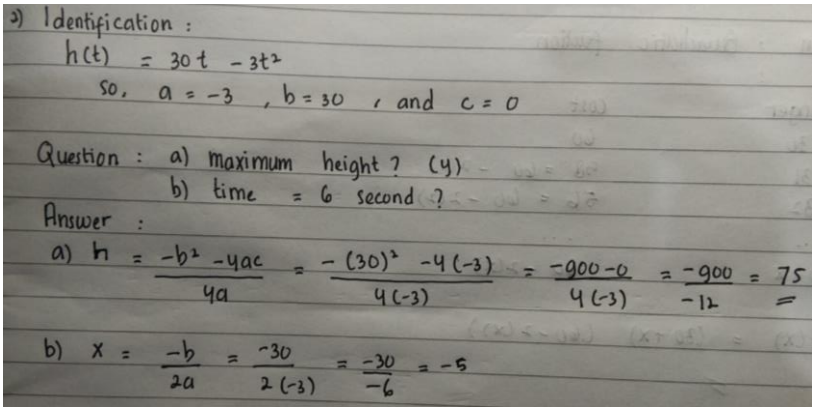


Figure 2. Answer to Question Number 2

The following is an excerpt from an interview with student 3 (S3).

...

A : "Based on your answer to question 2, do you think anything is missing or wrong?"

S3 : "Oh yeah, for the answer's conclusion, it is missing. The ball should not reach its maximum height at t = 6 seconds."

A : "Yes, that is correct. Also, please recheck your other answers..."

S3 : "Oh yeah, sorry about that. I was rushing when I did it, hehe. Answer a is missing a unit, right?"

A : "Yes, what are the units for answers a and b?"

S3 : "For it is 75 meters, and for b, it is 5 seconds, ma'am."

...

Based on the results of the test and interview above, it can be seen that student 3 (S3) made careless mistakes. He made a mistake in writing the correct answer for question 2b. In addition, the student also forgot to write the unit of the answer that was written. The student was in a hurry to complete the problem, so he was not careful and did not check his answers. As a result, the final result of his answer became incorrect.

Concept Errors

The percentage of conceptual errors is 20%. Most students already have a sufficient understanding of the prerequisite material used for problem-solving. However, a few students still make conceptual errors in solving problems. An example of a student who made a conceptual error is student 1 (S1). The error can be seen in Figure 3.

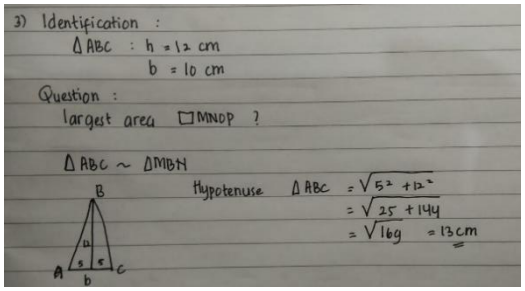


Figure 3. Answer to Question Number 3

Here is an excerpt from an interview with student 3 (S3).

...

A : "Why did you use the Pythagorean formula for question number 3?"

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S3 : "I imagined that to find the largest area of the MNOP rectangle, its length and width must be found first, so I tried to use Pythagoras to find it because MNOP is inside this triangle" (pointing to the picture)

A : "Please check again whether, by finding the other side of this triangle, you will get the length and width of the MNOP triangle?"

S3 : "It does not seem like it, but... I am confused, hehe."

A : "Okay, let us assume that we are told that ΔABC~ΔMBN, which sides do you think correspond?"

S3 : "MN and AC, BN and BC, BM and AB, ma'am"

A : "Right, and the heights are also corresponding, right?"

S3 : "Oh yeah... (pausing for a moment). They are also corresponding, hehe."

A : "Yes, so we can write $\frac{MN}{AC} = \frac{t\Delta MBN}{t\Delta ABC}$, do you remember this material?"

S3 : "Yes, sir, but yesterday I was confused about how to work on it."

A : "Also, do you remember how to determine the maximum value of a quadratic function?"

S3 : "Yes sir... the formula is like the one in answer number 2."

A : "Yes, why didn't you use that formula when working on question number 3?"

S3 : "Yesterday, I was confused, sir. I also did not quite understand the meaning of the problem because I rarely work on story problems like this, ma'am."

...

Based on the results of the work and interviews above, it can be seen that student 3 (S3) made a conceptual error. He thought the rectangle MNOP could be found using the Pythagorean formula, so he was wrong in using the formula, resulting in his final answer being wrong.

Aplication Errors

The percentage of application errors is 33.33%. An example of a student who experienced an application error is student 5 (S5). The error can be seen in Figure 4.

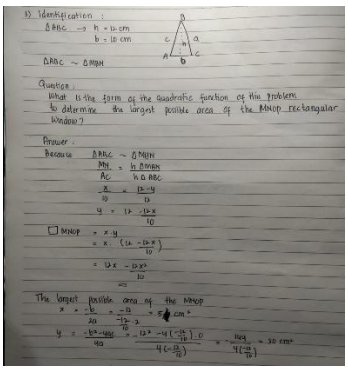

Figure 4. Answer to Question Number 3

Here is an excerpt from an interview with student 5 (S5).

...

A : "Look at your answer to question 3. Why did you stop at this point? (pointing to the answer sheet)."

S5 : "I only knew until there, ma'am."

A : "Okay, do you remember the formula for the optimal value?"

S5 : "Yes, sir. $y = -\frac{D}{4a}$and $x = -\frac{b}{2a}$."

A : "For the maximum area of rectangle MNOP, why did you use the formula $-\frac{b}{2a}$?"

S5 : " I was confused about which one to use, so I use both."

...

Based on the results of the test and interview, it can be seen that student 5 (S5) made application errors. The student knew the formula used to solve quadratic function problems, but only superficially. They did not fully understand the meaning of the symbols in the formula itself, so they knew the formula but could not apply it to solve problems.

Test Taking Errors

The percentage of errors during the test is 66.67%. An example of a student who made a mistake during the test is student 5 (S5). The mistake can be seen in Figure 5.

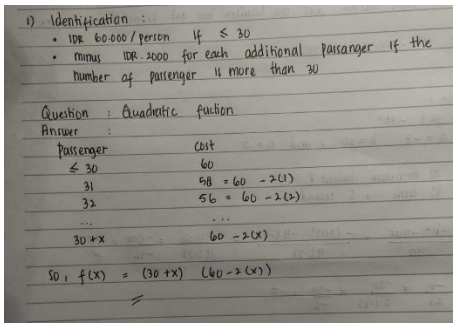

Figure 5. Answer to Question Number 3

Here is an excerpt from an interview with student 5 (S5)

...

N : "Let us take a look at your answer for question number 1, why did you stop at this point?" (pointing to the answer sheet)

S5 : "Yesterday, I was unsure about my answer, so I just stopped there."

N : "Can you convert this answer into quadratic form?"

S5 : "Do you mean multiply it out, ma'am?"

N : "Yes, that is right. Can you try it?"

S5 : "So it becomes $1800 - 2x^2$Right?"

N : "Yes, that is correct. So, in conclusion, you need to write that the quadratic function is $(x) = 1800 - 2x^2$."

...

Based on the analysis of answers and interviews above, it can be seen that student 5 (S5) made mistakes during the test. The student could not complete the answer and did not provide a concluding statement.

DISCUSSION

Based on the data analysis guided by Nolting's theory and supported by interviews with the 5 relevant students, the following will describe the types of errors and factors that cause students to experience these errors.

Misread-Directions Errors

Research shows that student 2 (S2) made a mistake in reading instructions. These findings are consistent with the research conducted by Fathiyah (2020) and Ulpa et al. (2021), which indicate that errors in reading instructions often manifest in students simply writing down the final answer without explaining, misunderstanding the problem's meaning, failing to identify the known and asked components in the problem, lacking comprehension of the symbols used in the problem, and struggling to interpret descriptions depicted in accompanying visuals. Consequently, Khatimah (2021) suggests that misread directions errors can be attributed to insufficient attention or concentration, hastily reading through instructions and a limited understanding of the language or terminology utilized in the instructions.

 Print ISSN: 2088-2157, Online ISSN: 2580-0779

Based on the results of the analysis of tests and interviews with students who made mistakes in reading instructions, several factors causing these mistakes were found, including:

a. Low reasoning ability of the students,
b. Weak ability of students to identify information in the form of writing or pictures into relevant mathematical concepts,
c. Lack of understanding of the students, and
d. Students' insufficient depth in understanding the material and practicing problems, especially those in the form of story problems.

Careless Errors

The research results show that student 3 (S3) made careless mistakes. Swan also revealed the same mistake, that human errors can be seen for various reasons, such as lack of concentration, rushed thinking in solving problems so that he is not careful, a complete memory, or a failure to note essential things when studying (Faturrochmah et al., 2021), and not checking his answers (Ulpa et al., 2021).

Based on the results of the test and interviews with students who made careless mistakes, several factors causing these mistakes were identified, including:

a. Students were too hasty and careless in solving problems.
b. Students did not check their answers before submitting them to the researcher.

Concept Errors

Based on the result, S3 was wrong in using the formula, resulting in his final answer being also wrong. It is in line with the research findings of Oktafia & Sutama (2019), which state that conceptual errors are caused by students incorrectly using formulas to answer problems presented in the questions, as well as using formulas that are not suitable for the conditions or prerequisites for the formula to be applied.

Based on the results of the test analysis and interviews with students who made conceptual errors, several factors causing these errors were found, including:

a. Lack of deep understanding of concepts such as quadratic equations, quadratic functions, and similarity.
b. Lack of practice with story problems.

Application Errors

Based on the test analysis and interviews, the student knew the formula used to solve quadratic function problems, but only superficially. They did not fully understand the meaning of the symbols in the formula itself, so they knew the formula but could not apply it to solve the problem. It is in line with the findings of Ulpa et al. (2021), who stated that students know the formula used to solve the problem. However, they cannot apply it to solve problems.

Based on the results of the test analysis and interviews with students who made application errors, several factors causing the errors were found, including:

a. Students only memorize formulas without understanding the meaning and symbols in the formula,
b. Lack of practice problems that should help students improve their ability to apply concepts and formulas learned in the problems.

Test Taking Errors

Based on the research result, the student (S5) could not complete the answer and did not provide a concluding statement. It aligns with Puspita's statement that students make mistakes by not writing conclusions or writing incorrect conclusions (Faturrochmah et al., 2021), and students do not complete the answers to the problem (Sukmawati & Amelia, 2020).

Based on the results of the test analysis and interviews with students who made mistakes during the test, several factors causing the errors were identified, including:

a. students are not used to writing the final answer with a concluding sentence,
b. students forgot to end their answers with a concluding sentence,

c. students felt unsure about their answer, which made them hesitant to express a conclusion and
d. Students were not good at managing their time when working on the problems, which caused them to be unable to finish their work.

The students' mistakes are indeed the result of their efforts to build their knowledge, so mistakes should be seen as part of the learning process and used to improve the quality of learning in the classroom. On the other hand, difficulties are seen as caused by the procedure's complexity and the incomplete information on the approach being used. Student learning difficulties can be detected by the emergence of errors made by students when working on math problems (Farida, 2015). Students' difficulties in participating in the learning process itself are caused by disruptions experienced by students, both internally and externally, also known as learning obstacles (Tastbita et al., 2020). Obstacles or difficulties cannot be avoided because they are essential to learning. Based on the description of the types of errors and the factors causing students to make mistakes above, the researchers offer several solutions to address them, including:

a. To minimize misread-direction errors, students need to adopt specific strategies. Firstly, they should be more careful and attentive when reading problems, ensuring they fully understand the instructions before proceeding. It includes identifying the information to be provided and the specific question being asked. Additionally, practicing problem-solving regularly can enhance students' reasoning skills and familiarize them with different problems. Doing so can make them more proficient in understanding and interpreting instructions accurately. (Khatimah, 2021) also emphasizes the significance of carefully reading instructions, paying attention to keywords or terms used, and avoiding hasty approaches to ensure a lower incidence of misread-direction errors.
b. The solution to minimize careless errors includes several steps. Firstly, it is essential not to rush when working on the questions. Taking the time to read and understand each problem carefully can help prevent careless mistakes. Additionally, reviewing and double-checking the answers before submitting them is recommended. It can be beneficial to recheck the calculations or solutions to ensure accuracy. These measures can help minimize careless errors and improve overall accuracy in problem-solving.
c. Several strategies can be employed to minimize concept errors. Firstly, it is crucial for students to thoroughly understand the concepts and example problems before facing assessments or tests. It can be achieved by actively studying the material, seeking clarification from the teacher if any concepts are challenging or unclear, and addressing prerequisite knowledge gaps by reviewing relevant materials. Additionally, students should verify their understanding of mathematical concepts by double-checking their knowledge and seeking feedback from teachers or peers. Implementing these measures aligns with (Anggraini, D., 2014) recommendation of deepening understanding and knowledge of concepts and practicing problem-solving to reinforce comprehension and knowledge.
d. The solution to minimize application errors involves students practicing various types and levels of problem-solving exercises. By doing so, they can familiarize themselves with different problem scenarios and effectively apply the concepts and formulas they have learned to solve test questions. Regular practice enables students to enhance their problem-solving skills, gain confidence in their abilities, and minimize errors in applying their knowledge during tests.
e. The solution to minimize errors during tests (test-taking errors) includes several steps. Firstly, students should read the instructions carefully and understand the test requirements before working on the questions. Next, they need to deepen their understanding and knowledge of the subject matter being tested. They should approach mathematical calculations with care and precision, ensuring accuracy in their work. Students need to write their answers clearly to avoid any misunderstandings. Additionally, they should manage their time effectively during the test, allocating sufficient time to each question. Lastly, having self-confidence is crucial to performing optimally during the test.

 Print ISSN: 2088-2157, Online ISSN: 2580-0779

f. In addition, it is also necessary to analyze students' learning obstacles to identify difficulties they face in solving quadratic function story problems to minimize the common mistakes made by students.

CONCLUSION

Based on the research and discussion, it can be concluded that students make 5 types of errors in solving quadratic function story problems based on Nolting's theory. Firstly, misreading directions error accounts for 30%, caused by low reasoning ability of the students, weak ability of students to identify information into relevant mathematical concepts, lack of understanding of the students, and students' insufficient depth in understanding the material and practicing problems, especially those in the form of story problems. Secondly, careless errors account for 40%, caused by students rushing and a lack of carefulness in solving problems. Thirdly, concept error accounts for 20%, caused by students' lack of understanding and mastery of quadratic equation and function concepts and lack of practice with story problems. Fourthly, application errors account for 33.33%, caused by students memorizing formulas without knowing the meanings and symbols used in the formulas and lack of practice problems that should help students improve their ability to apply concepts and formulas learned in the problems. Fifthly, test-taking errors account for 66.67%, caused by students being unfamiliar with writing conclusions and not completing their answers. Students felt unsure about their answers, which made them hesitant to express a conclusion, and students were not good at managing their time when working on the problems, which caused them to be unable to finish their work. Another contributing factor to students' errors is their infrequent practice of solving story problems.

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 Print ISSN: 2088-2157, Online ISSN: 2580-0779