Students' Errors in Solving Contextual Linear Programming Problems Based on Brodie's Theory Viewed from Self-Efficacy

Aswin[1*], Achmad Salido[1], Rafika Meiliati[1], Dayana Sabila Husain[1], Khairunnisa[2]

[1]Mathematics Education, Universitas Sembilanbelas November Kolaka, Indonesia
[2]Mathematics Education, UIN Sumatera Utara, Indonesia
[*]Penulis Korespondensi: aswinsalsri23@gmail.com

Received: 26-05-2026; *Revised*: 13-06-2026; *Published*: 22-06-2026

Abstract: *This study aims to analyze students' errors in solving contextual mathematics problems on linear programming, based on Brodie's theory, through the lens of students' self-efficacy. Previous studies have generally used Newman Error Analysis and focused more on the procedural stages of problem-solving, whereas studies integrating Brodie's theory with self-efficacy in solving contextual problems remain limited. This study offers a novel approach, an error analysis that integrates cognitive and affective aspects to gain a more comprehensive understanding of student errors. The study employs a qualitative case study design. It was conducted at a high school in Bulukumba, with a student population of 36. Subjects were selected purposively: three students representing the high-, moderate-, and low-self-efficacy categories. Research instruments included contextual problem-solving tests, a self-efficacy questionnaire, interviews, observations, and documentation. Data analysis was conducted using the Miles and Huberman model, with the stages of data reduction, data presentation, and conclusion drawing, and triangulation to ensure data validity. The results of the study indicate that students with high self-efficacy made only basic errors, such as errors in examples and failure to write conclusions. Students with moderate self-efficacy made basic errors, had missing information, and made appropriate errors, while students with low self-efficacy made a wider variety of errors, namely basic errors, appropriate errors, missing information, and partial insight. These findings indicate that self-efficacy influences the types and levels of errors students make when solving contextual problems. Therefore, improving self-efficacy needs to be a focus in mathematics learning to minimize problem-solving errors.*

Keywords: *Brodie's Theory; Contextual Problems; Error Analysis; Linear Programming; Self-efficacy*

INTRODUCTION

Mathematics is a fundamental discipline that plays a crucial role in many aspects of life, including education, scientific and technological advancement, and everyday decision-making. It is not merely a tool for computation, but also a medium for developing logical, critical, systematic, analytical, and creative thinking skills (Depaepe et al., 2020; Koskinen & Pitkäniemi, 2022; Sari, 2023). In the context of formal education, mathematics learning is not solely focused on mastering concepts, principles, and procedures, but also on fostering meaningful problem-solving skills. These skills enable students to apply their knowledge flexibly in a variety of situations. One effective approach to achieving this objective is to use contextual problems closely related to real-life situations or students' daily experiences. Through such problems, learning becomes more relevant and meaningful, and students are encouraged to actively construct knowledge while recognizing the practical value of mathematics (Fatkurochman et al., 2024; Setyani & Kristanto, 2020).

Contextual problems require students to engage in deeper understanding and higher-order thinking processes (Utami et al., 2024). Students must identify relevant information, interpret problem situations accurately, and connect mathematical concepts to real-world contexts coherently. This process promotes active engagement and supports the development of flexible and adaptive thinking. Students are required to adjust their strategies when encountering different problem situations, which strengthens their problem-solving competence. In addition, contextual learning environments can enhance students' motivation by showing the direct relevance of mathematics to their lives. As a result, mathematics education is expected to produce learners who are not only academically competent but also capable of applying mathematical knowledge effectively in diverse real-life contexts. Such competence is essential in preparing students to face increasingly complex challenges in both academic and practical domains.

Despite these expectations, many students still encounter difficulties when solving contextual mathematics problems. These difficulties often result in various types of errors that occur at different stages of the problem-solving process. Students may experience challenges in understanding the problem, planning appropriate solution strategies, executing procedures correctly, or drawing accurate and complete conclusions. For example, students frequently misinterpret the information presented in contextual problems. They may also struggle to translate verbal descriptions into appropriate mathematical models, which is a critical step in solving such problems (Kahfi et al., 2022). These challenges indicate that contextual problems require not only conceptual understanding but also the ability to integrate multiple cognitive processes simultaneously.

In addition to difficulties in understanding and modeling, procedural errors frequently occur during the solution process. Students may apply incorrect algorithms, perform inaccurate calculations, or fail to follow systematic procedures. They may also produce conclusions that are inconsistent with the obtained results or with the problem requirements. These conditions suggest that students have not fully integrated their conceptual understanding with their procedural knowledge. Furthermore, such errors reflect weaknesses in mathematical thinking, both in conceptual and procedural aspects (Jupriyanto et al., 2024). Therefore, conducting a systematic error analysis is essential to identify the types, patterns, and underlying causes of students' errors. The results of such analysis can serve as a foundation for designing more effective instructional strategies that reduce errors and enhance students' ability to solve contextual problems accurately and systematically (Arni et al., 2023; Fadiana et al., 2021).

One important internal factor that influences students' performance in solving contextual problems is self-efficacy. Self-efficacy refers to an individual's belief in their ability to organize and execute actions required to achieve specific goals. In the context of mathematics learning, self-efficacy influences how students perceive task difficulty, select problem-solving strategies, regulate their effort, and maintain persistence when facing obstacles. Students with high self-efficacy tend to be more confident in their abilities and more willing to explore alternative strategies. They also demonstrate greater persistence and are less likely to give up when encountering difficulties. In addition, they tend to be more careful and reflective when reviewing their solution processes, which helps minimize errors (Leavy et al., 2023; Shaheema et al., 2023).

In contrast, students with low self-efficacy often doubt their abilities and experience higher levels of anxiety when dealing with challenging problems. They tend to be less persistent and more likely to avoid tasks that they perceive as difficult. This condition can lead to rushed decision-making, incomplete reasoning, and careless calculations. As a result, the likelihood of errors increases, including conceptual, procedural, and inferential errors (Koner & Mazumder, 2024; Nkrumah et al., 2021). These differences indicate that self-efficacy plays a significant role in shaping both the process and outcomes of students' mathematical problem-solving. Therefore, understanding the relationship between self-efficacy and students' errors is important for improving the quality of mathematics instruction, particularly in the context of contextual problem solving.

Previous studies have investigated students' error analysis in mathematics learning by considering both cognitive and affective aspects, including self-efficacy. However, most of these studies rely on Newman's Error Analysis, which classifies errors into five categories (Puspitaningati et al., 2024; Sarah et al., 2023). While this framework is useful, it tends to focus on procedural stages rather than on the deeper nature of students' thinking processes. Other studies have examined related constructs, such as critical thinking, but have not specifically focused on detailed error patterns in contextual problem settings (Endika et al., 2025). Consequently, there is limited exploration of alternative theoretical perspectives that can provide a more comprehensive understanding of students' errors. One such perspective is Brodie's theory, which emphasizes the nature of errors and their relation to students' conceptual understanding and thinking processes.

In addition, studies that explicitly examine the relationship between error types based on Brodie's theory and students' self-efficacy in the context of contextual mathematics problems remain scarce. This gap indicates the need for research that integrates cognitive and affective dimensions within a single analytical framework. Addressing this gap is important because it allows for a more holistic understanding of students' learning processes. It also provides insights into how internal factors, such as self-efficacy, interact with cognitive processes during problem-solving. Such understanding is essential for developing instructional approaches that are both conceptually meaningful and psychologically supportive.

Based on these considerations, this study aims to analyze students' errors in solving contextual mathematics problems based on Brodie's theory and to examine these errors in relation to students' self-efficacy levels. This study focuses on contextual problems arising from real-life situations, which add complexity to the problem-solving process. It not only identifies the types of errors students make but also explores how these errors vary across levels of self-efficacy. The findings of this study are expected to contribute to the development of mathematics education by providing a more comprehensive understanding of students' errors from both cognitive and affective perspectives. In addition, the results are intended to inform the design of instructional strategies that emphasize contextual learning and enhance students' self-efficacy, thereby reducing errors and improving problem-solving performance.

METHOD

This study employed a qualitative case study design. It aimed to explore in depth the forms of students' errors in solving contextual problems on linear programming material in relation to their levels of self-efficacy. This approach was selected because the study did not focus on hypothesis testing or specific treatments. Instead, it sought to understand naturally occurring phenomena, particularly those related to students' thinking processes when solving mathematics problems. Using a descriptive qualitative approach, the researcher provided a detailed account of the types of errors students made and the factors underlying them in an authentic classroom context.

The study was conducted at a school in Bulukumba Regency, with research subjects selected using purposive sampling. The subjects consisted of three students representing the categories of high self-efficacy (ST01), moderate self-efficacy (SS02), and low self-efficacy (SR03). The selection of subjects based on these categories aimed to capture variations in students' self-efficacy characteristics, thereby enabling the researcher to analyze the differences in error patterns emerging within each category in greater depth. The limited number of subjects in this study aligns with the nature of qualitative research, which prioritizes the depth of analysis over sample size.

The instruments used in this study included a contextual test on linear programming, a self-efficacy questionnaire, an in-depth interview guide, an observation sheet, and documentation of students' work. The test was used to identify the types of errors students made, while the self-efficacy questionnaire was used to group students by their self-confidence levels. Interviews were conducted to delve deeper into students' thought processes and the reasons for the errors. Observations and documentation were used to supplement and strengthen the data obtained. The self-efficacy indicators used in this study consist of three aspects: 1) Magnitude, whose indicators include beliefs regarding the difficulty level of tasks and the selection of behaviors to overcome difficulties. 2) Strength, with indicators of strong and firm confidence in the assigned task. 3) Generality, with indicators of confidence in one's ability in specific activities or situations and confidence in one's ability in broader activities or situations

The indicators of each error type based on Brodie's theory used in this study are presented in Table 1(Brodie, 2010; Vhantoria, 2021).

Table 1. Indicators of Brodie's Theory

Error Type	Indicators
Basic error	1. Students do not fully understand the problem and do not completely state the known information 2. Students make computational errors 3. Students make errors in algebraic manipulation 4. Students construct incorrect mathematical models
Appropriate error	Students incorrectly apply concepts related to linear programming
Missing information	Students provide incomplete responses

Partial insight	Students provide partially correct answers, but demonstrate incomplete understanding or insight

The categorization of students' self-efficacy according to (Azwar, 2020) is shown in Table 2 below

Table 2. Categories of self-efficacy

Rentang Skor	Tingkatan
$X < (\mu - \sigma)$	Rendah
$(\mu - \sigma) \leq X < (\mu + \sigma)$	Sedang
$(\mu + \sigma) \leq X$	Tinggi

The contextual questions used are as follows: 1) Ria has Rp100,000.00, which she plans to use to buy books at the school cooperative. Book A costs Rp5,000.00 and Book B costs Rp4,000.00. The total number of books Ria must buy is no more than 20. If the number of Book A she must buy is no more than 15, then determine: a. The mathematical model. b. Its solution set, 2) A furniture company manufactures two types of shelves bookcases and shoe racks using the same two raw materials: teak wood and varnish. To produce one bookcase, 10 pieces of teak wood and 3 cans of varnish are required, while to produce one shoe rack, 6 pieces of teak wood and 1 can of varnish are required. The production costs for bookshelves and shoe racks are Rp 40,000 and Rp 28,000 per unit, respectively. For one production period, the company uses at least 120 pieces of teak wood and 24 cans of varnish. If the company must produce at least 2 bookcases and at least 5 shoe racks, determine the number of bookcases and shoe racks that must be produced to minimize production costs

In this study, the researcher acted as the primary instrument responsible for planning, conducting, and interpreting the entire research process. Data were collected through multiple techniques, including tests, questionnaires, interviews, observations, and documentation. The collected data were analyzed using the interactive model of Miles and Huberman, which consists of three stages: data reduction, data display, and conclusion drawing (Miles et al., 2014). Data reduction involved selecting and focusing on data relevant to the research objectives, particularly those related to the types and causes of students' errors. The data were then presented in a systematic narrative format to facilitate the identification of emerging error patterns. The final stage involved drawing conclusions, which was carried out continuously throughout the research process to ensure the accuracy and consistency of the findings. To ensure data validity, this study employed triangulation of sources and methods by comparing data collected using different techniques. This approach enhanced the credibility, consistency, and trustworthiness of the research findings.

RESULTS AND DISCUSSION

This study aimed to examine students' errors in solving contextual mathematics problems based on Brodie's theory in relation to their self-efficacy levels. Based on a questionnaire administered to 61 students, an overview of students' self-efficacy levels was obtained, as presented in 3.

Table 3. Distribution of Students' Self-Efficacy Levels

Range	Level	Frequency	Percentage (%)
x ≥ 26,74	High	9	14,75
19,64 ≤ x < 26,74	Medium	45	73,77
x < 19,64	Low	7	11,48
Total		61	100

Referring to Table 3, most students in Class XI Science 2 and XI Science 3, totaling 61 students, fall into the medium self-efficacy category (45 students, 73.77%). The smallest proportion is found in the low category, with 7 students (11.48%). Furthermore, a contextual mathematics test on linear programming material was administered to students in Class XI Science 1 and XI Science 3 at a public senior high school in Bulukumba Regency. After completing the test, the researcher calculated each student's score using predetermined assessment criteria. One representative student from each self-efficacy category was then selected for in-depth analysis of the errors made.

Based on the results of students' work in solving contextual math problems on linear programming, various types of errors made by students were identified. These error patterns are presented in nine examples of student work that represent high, moderate, and low learning motivation categories across the dimensions of self-efficacy, effort, and anxiety. These errors were then classified based on Brodie's theory. In summary, the results of the error analysis using Brodie's theory for 9 students from each motivation level and each dimension can be seen in Table 4 below

Table 4. Student errors based on Brodie's theory as viewed from the perspective of self-efficacy

Question	Subjek	Types of Errors	Types of Errors According to Brodie's Theory
1	ST01	• The subject made an incorrect assumption • The subject did not state the conclusion	Basic error
	SS02	• Failing to include known information in the problem • Incorrect subject in the assumption • The model created is incomplete	Basic error
	SR03	• The student made an error in the assumption • The model created is incomplete • The student did not state a conclusion • The student made an error in determining the intersection point • The student made an error in determining the solution set	Basic error, appropriate error and missing information
2	ST01	• Failing to include known information in the problem • Using the wrong variable in the equation	Basic error
	SS02	• Failing to include known information in the problem • Incorrect subject in the assumption • Incorrect subject in determining the critical point	Basis error and appropriate error

SR02	• Failure to include known information in the problem • Incorrect subject in the assumption • The model created is incomplete • The answer is incomplete	Basic error and missing information

Based on students' written responses to solving contextual linear programming problems, various types of errors were identified. These errors were illustrated through selected student responses representing high, medium, and low self-efficacy categories. The errors were then classified according to Brodie's theory. One example of a student's response in the high self-efficacy category is presented in Figure 1. Figure 1 shows that the student coded ST01 generally solved the first problem correctly. However, fundamental errors were found in their solution. These errors included failing to define variables and to include conclusions in their written answers.

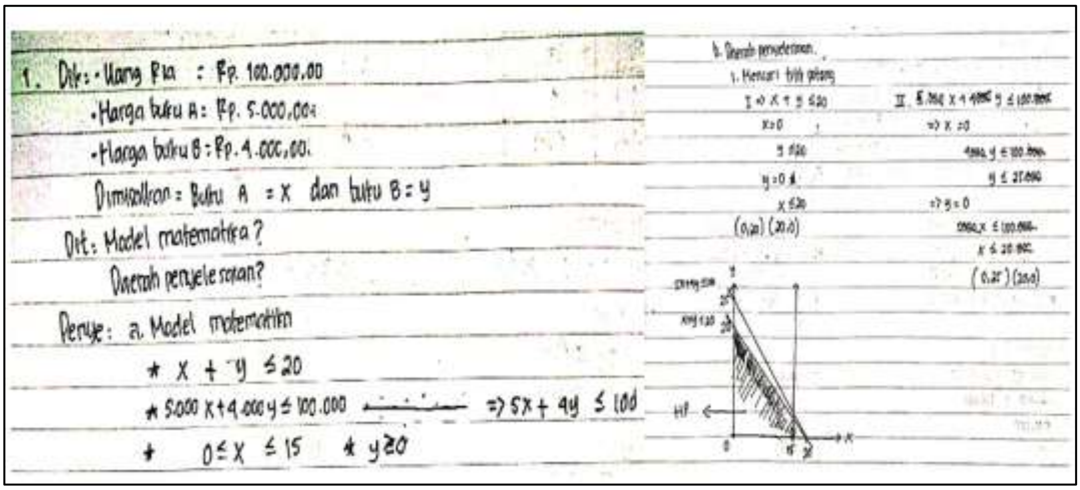

Figure 1. Response of the high self-efficacy subject (ST01) to the first problem

The following is an excerpt from an interview with ST01

P : Okay, good. Next, what does x = book A and y = book B mean?

ST01 : Um, the total number of books, sir…

P : So? Why wasn't it written out in full?

ST01 : Hmm, I was in a hurry, sir

Based on interview results, ST01 demonstrated a clear understanding of the problem. The student accurately rephrased the problem in their own words. However, errors still occurred during the solution process, particularly in the variable definition stage. This error was due to the student's haste, which led them to forget to write the variable definition. A similar problem occurred in other parts of the answer, where they neglected to write the conclusion, which was caused by carelessness. Figure 2 further shows that ST01 correctly solved Problem 2. Nevertheless, basic errors were again identified, including failing to write the known information and an error in defining variables.

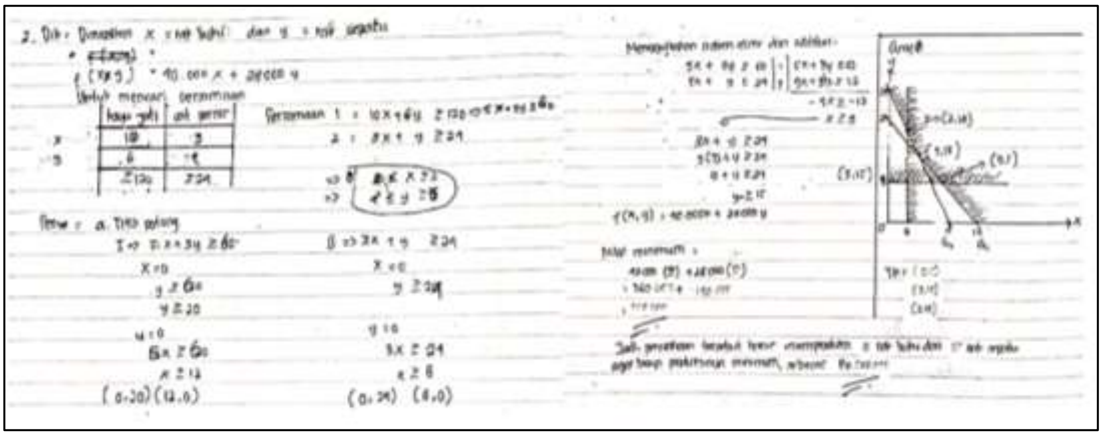

Figure 2. Response of the high self-efficacy subject (ST01) to the second problem

The following is an excerpt from an interview with ST01

P : Okay, so in the model you created, why did you use the symbol ≥ ? Was that indicated in the problem?

ST01 : Yes, sir, it was. Because the problem included the phrase "at least."

P : Okay, so how did you find the intersection of the lines?

ST01 : Using the substitution and elimination methods, sir.

The interview revealed that ST01 was able to identify the known information in Problem 2. However, the student did not write it down because they immediately proceeded to the modeling stage. This finding indicates that the omission was not due to a lack of understanding, but rather due to inattention. Overall, ST01 demonstrated a strong understanding of linear programming concepts. Therefore, students with high self-efficacy tend to make only basic errors, such as inaccuracies in defining variables and failure to include conclusions. These findings suggest that such students are generally able to solve contextual mathematics problems correctly. This result is consistent with previous studies indicating that students with high self-efficacy tend to produce accurate solutions, although minor errors may still occur (Noviza et al., 2019; Rasid et al., 2021; Zhou et al., 2020)

An example of a student's response in the medium self-efficacy category is presented in Figure 3. The figure shows that the student coded SS02 solved Problem 1 reasonably well. However, several errors were identified, including basic errors and missing information. These errors included failing to write the known information, making mistakes in defining variables, and constructing an incomplete mathematical model. Based on the interview findings, SS02 understood the problem and explained it correctly. However, errors occurred during the solution process due to habitual practices, such as failing to write known information.

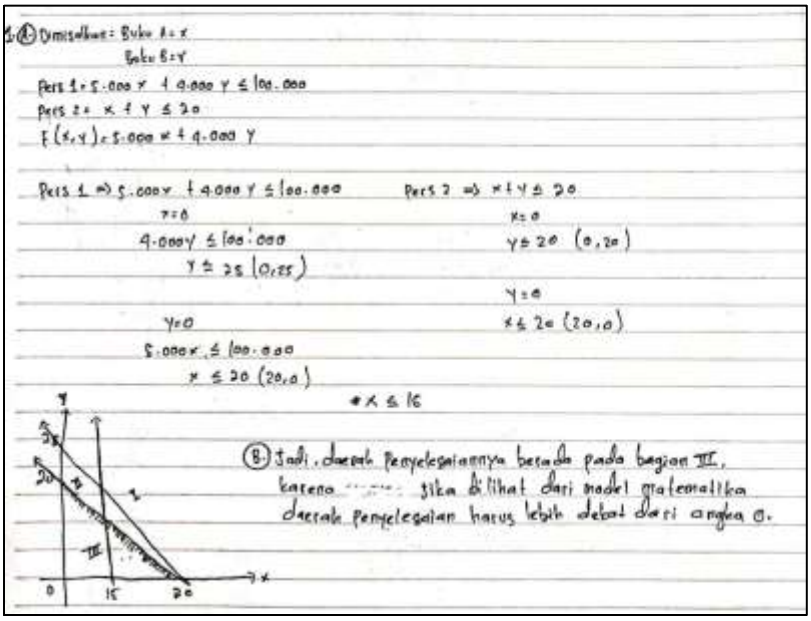

Figure 3. Response of the medium self-efficacy subject (SS02) to the first problem

The following is an excerpt from an interview with SS02

P : Is it possible that the number of books A and B purchased by Ria is negative?

SS02 : No, sir. Oh, so it should be x ≥ 0 and y ≥ 0, right, sir?

P : Yes, why didn't you write that down?

SS02 : Yes, sir, I forgot, but that's what was taught and it's in my workbook.

In addition, SS02 actually understood the meaning of the variables used in the model but forgot to define them explicitly. The incomplete model was also caused by forgetting to include necessary constraints, even though the student had previously written them in class notes. Figure 4 shows that SS02 also solved the second problem but still made several errors. These included basic errors and appropriate errors, such as omitting known information, incorrect variable definitions, and errors in determining critical points. Further interviews revealed that the student did not recheck their work, which contributed to these errors.

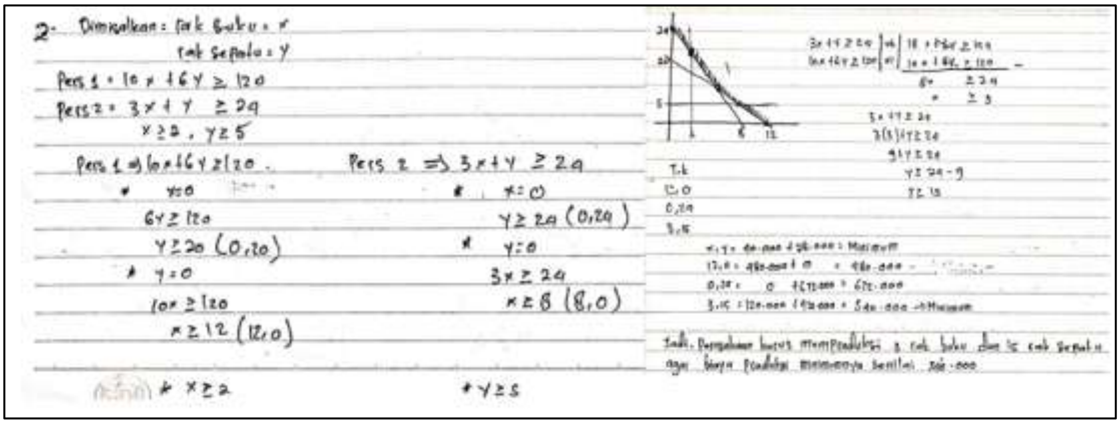

Figure 4. Response of the medium self-efficacy subject (SS02) to the second problem

The following is an excerpt from an interview with SS02

P : Hmm, are you sure? Try checking again.

SS02 : Hmm, is this the one, sir? So, did I get the critical points wrong, sir?
P : Yes, that should be the part. Did you double-check the answer you wrote for number 2?
SS02 : No, sir.

Based on the analysis, students with medium self-efficacy exhibited errors categorized as basic, missing information, and appropriate. These errors included omission of known information, incorrect variable definitions, incomplete models, errors in determining critical points, and the absence of conclusions. In addition, some responses indicated partial understanding of the material. These findings suggest that students with medium self-efficacy are generally capable of solving problems, although inaccuracies still occur. This result is consistent with previous studies indicating that such students can perform adequately but are still prone to certain errors (Imaroh et al., 2021; Leavy et al., 2023; Vorensky, 2019).

An example of a student's response in the low self-efficacy category is presented in Figure 5. The figure shows that the student who coded SR03 was unable to solve Problem 1 effectively. Several types of errors were identified, including basic, appropriate, and missing information. These errors included incorrect variable definitions, incomplete mathematical models, omitted conclusions, and incorrect determination of intersection points. Based on interview results, SR03 understood the general intent of the problem but encountered difficulties during the solution process.

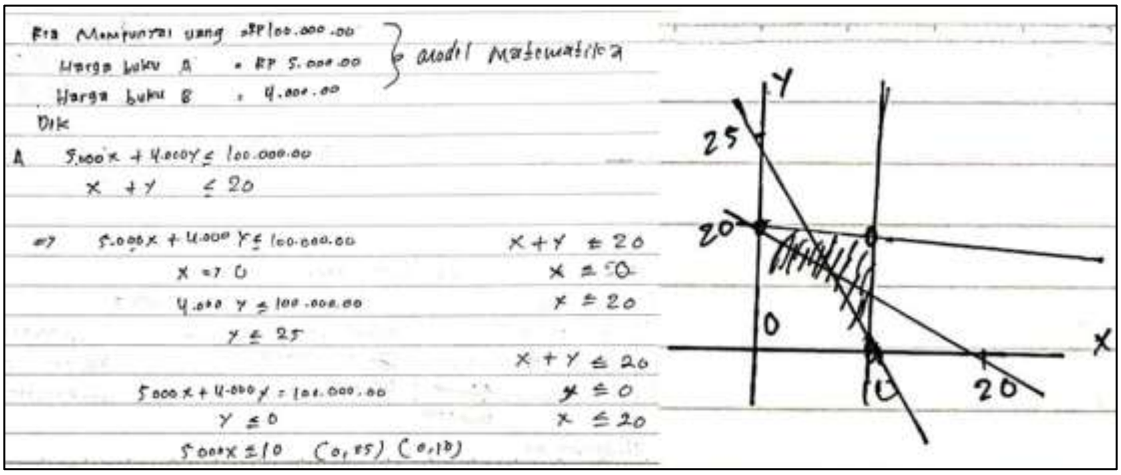

Figure 5. Response of the low self-efficacy subject (SR03) to the first problem

The following is an excerpt from an interview with SR03

P : Okay, is the intercept (0,10) correct? Check it.
SR03 : No, sir. I made a mistake. It should be (0,20).
P : Did you double-check it?
SR03 : No, sir.
P : What line is this?
SR03 : It's the line for $x \leq 10$ and $y \leq 20$, sir.
P : Where did you get 10 and 20?
SR03 : This one… uh, 15 and 20, sir. I misread it, sir.

The student reported understanding the steps required to solve the problem but was unable to apply them correctly. Errors in variable definition were caused by haste, while incomplete models resulted from insufficient attention to instructional explanations. Errors in determining intersection points were due to computational limitations and insufficient verification. In addition, errors in shading the feasible region were influenced by inaccuracies in the determination of intersection points. The student also added unnecessary lines to the graph, indicating a misunderstanding of the problem requirements.

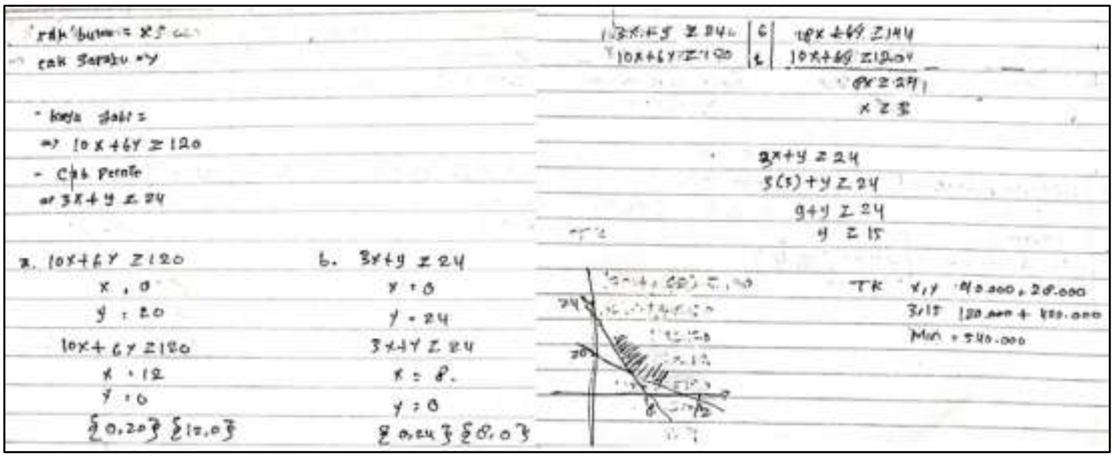

Figure 6. Response of the low self-efficacy subject (SR03) to the second problem

The following is an excerpt from an interview with SR03

P : Do you know when to use curly braces?
SR03 : No, sir.
P : Okay, let's move on. Why isn't the answer you wrote down finished?
SR03 : Because there was a part of the problem I didn't understand, and I didn't know what to do with it. Also, I ran out of time, sir.
P : What is the purpose of finding the values of x and y?
SR03 : To find the intersection of the lines in this diagram, sir.

Figure 6 shows that SR03 attempted to solve Problem 2 but made several errors, including basic errors and missing information. These errors included failing to write known information, incorrect variable definitions, incomplete models, and an unfinished solution. Further analysis revealed that the student did not fully understand certain parts of the problem, which prevented the solution from being completed. This lack of understanding also affected the accuracy of the mathematical model. In addition, the student demonstrated limited understanding of prerequisite concepts, particularly in expressing coordinate points. Time constraints also contributed to the incomplete response.

Overall, students with low self-efficacy exhibited a wide range of errors, including basic errors, appropriate errors, missing information, and partial insight. These errors involved incomplete problem representation, incorrect modeling, procedural inaccuracies, and limited conceptual understanding. The findings indicate that students with low self-efficacy tend to experience greater difficulty in solving contextual problems. As a result, they are more likely to make multiple and varied errors. This result is consistent with previous studies suggesting that low self-efficacy is associated with greater difficulty in problem-solving and a higher likelihood of errors (Ramlan et al., 2021; Sumliyah et al., 2020).

This study contributes to the body of research on the relationship between self-efficacy and students' errors when solving contextual mathematics problems in linear programming. The results indicate that students' self-efficacy levels influence the types and severity of errors made during the problem-solving process. Students with high self-efficacy tend to make simple errors, while students with moderate and low self-efficacy exhibit a wider variety of more complex errors, both in terms of conceptual understanding and problem-solving procedures. These findings confirm that self-efficacy plays a crucial role in supporting the quality of students' thinking processes and their success in solving mathematical problems.

In practical terms, the findings of this study highlight the importance of teachers' efforts not only to develop students' cognitive abilities but also to enhance their self-efficacy through positive learning experiences, constructive feedback, and instruction that encourages active student engagement. Understanding how errors vary with levels of self-efficacy can help teachers design more targeted instructional strategies, thereby reducing student errors and improving the quality of mathematics instruction.

Based on the research findings, it is recommended that future mathematics education development place greater emphasis on affective aspects, particularly self-efficacy, as a factor influencing student learning success. Future research should involve a larger sample size, cover a wider variety of mathematical content, and examine other factors that may influence student errors, such as math anxiety, learning styles, and critical thinking skills. Additionally, various instructional models or interventions that can enhance self-efficacy while minimizing student errors in solving mathematical problems need to be developed and tested.

DAFTAR PUSTAKA

Arni, A., Nurhayadi, N., & Ismaimuza, D. (2023). Application of the Realistic Mathematical Education (RME) Approach to the Operational Material of Addition of Fractions to Increase Activities and Learning Outcomes of Elementary School Students. In Jurnal Riset Pendidikan Mipa. https://doi.org/10.22487/j25490192.2023.v7.i1.pp1-13

Azwar, S. (2020). Penyusunan skala psikologi. Prenada Media.

Brodie, K. (2010). Teaching Mathematical Reasoning in Secondary School Classrooms (1st ed.). Springer. https://doi.org/10.1007/978-0-387-09742-8

Depaepe, F., Verschaffel, L., & Star, J. R. (2020). Expertise in Developing Students' Expertise in Mathematics: Bridging Teachers' Professional Knowledge and Instructional Quality. In ZDM. https://doi.org/10.1007/s11858-020-01148-8

Endika, D. I., Huda, N., & Marzal, J. (2025). Analisis Kegagalan Berpikir Kritis Siswa Berdasarkan Self-Efficacy pada Materi SPLDV. 13(2), 1029–1044.

Fadiana, M., Yulaikah, Y., & Kusumawati, D. H. (2021). The Development of Semiotic Based Contextual Mathematics Learning Videos to Support Learning From Home. In Al-Ishlah

Jurnal Pendidikan. https://doi.org/10.35445/alishlah.v13i1.372

Fatkurochman, M., Slamet, I., & Pramudya, I. (2024). Contextually Based Mathematics Learning Module Improves Students' Mathematical Literacy Abilities. In Journal of Education Research and Evaluation. https://doi.org/10.23887/jere.v8i1.73940

Imaroh, A., Umah, U., & Asriningsih, T. M. (2021). Analisis Kemampuan Pemecahan Masalah Matematika Ditinjau Dari Self-Efficacy Siswa Pada Materi Sistem Persamaan Linear Tiga Variabel. 4(4). https://doi.org/10.22460/jpmi.v4i4.843-856

Jupriyanto, J., Ulia, N., Sari, Y., Yustiana, S., & Robiatusofiyah, R. (2024). Utilization of Manual Calculation Media in Realistic Mathematics Education to Increase Students' Learning Motivation. In Jurnal Ilmiah Pendidikan Dasar. https://doi.org/10.30659/pendas.11.1.142-153

Kahfi, A., Hardiyansyah, D., & Farida, I. (2022). Students' Learning Motivation Analysis in Contextual Learning on Faraidh Fiqh Material. In Al-Tadzkiyyah Jurnal Pendidikan Islam. https://doi.org/10.24042/atjpi.v13i1.10523

Koner, S., & Mazumder, S. (2024). Academic Motivation, Self-Esteem and Personality Factors: A Review of Effect on Mathematics Anxiety. In International Journal of Literacy and Education. https://doi.org/10.22271/27891607.2024.v4.i1a.167

Koskinen, R., & Pitkäniemi, H. (2022). Meaningful Learning in Mathematics: A Research Synthesis of Teaching Approaches. In International Electronic Journal of Mathematics Education. https://doi.org/10.29333/iejme/11715

Leavy, A., Bjerke, A. H., & Hourigan, M. (2023). Prospective primary teachers' efficacy to teach mathematics: Measuring efficacy beliefs and identifying the factors that influence them. Educational Studies in Mathematics, 112(3), 437–460. https://doi.org/10.1007/s10649-022-10181-1

Miles, M. B., Huberman, A. M., & Saldana, J. (2014). Qualitative DataAnalysis A Methods Sourcebook Edition 3. SAGE Publications, Inc.

Nkrumah, I. K., Torto-Seidu, E., & Asamani, L. (2021). Reduction in Children's Impulsivity Enhances Performance in Mathematics, but Not English Language: Evidence for Impulsive Behaviour Modification Using Cognitive Modelling. In Mediterranean Journal of Social \& Behavioral Research. https://doi.org/10.30935/mjosbr/11338

Noviza, T., Hsrotoyo, A., & Yani, A. (2019). Kemampuan pemecahan masalah matematika ditinjau dari self-efficacy dalam materi geometri kelas XI SMK. Untan Pontianak.

Puspitaningati, N. P., Rejeki, S., Wahyu, P., Antonius, R., & Efficacy, S. (2024). Analisis kesalahan siswa dalam menyelesaikan soal matematika ditinjau dari self efficacy. 3(1), 26–36.

Ramlan, A. M., Hermayani, H., & Jahring, J. (2021). Analisis Kemampuan Pemecahan Masalah Matematis Ditinjau Dari Kepercayaan Diri. AKSIOMA: Jurnal Program Studi Pendidikan Matematika, 10(4), 2188. https://doi.org/10.24127/ajpm.v10i4.3996

Rasid, M., Surahmat, & Faradiba, S. S. (2021). Analisis kemampuan pemecahan masalah matematis ditinjau dari self efficacy materi sistem persamaan linier dua variabel pada kelas

VIII SMP negeri 04 Satu Atap Mukok Kabupaten Sanggau. Jurnal Penelitian, Pendidikan, Dan Pembelajaran, 16(32), 76–86.

Sarah, Y. D., Ariawan, R., Nufus, H., & Rezeki, S. (2023). Kesalahan Siswa dalam Menyelesaikan Soal Higher Order Thinking Skills ditinjau dari Self Efficacy. 9(1), 71–82.

Sari, T. T. (2023). Thong-Bhitongan: Development of Educational Media Based on Ethnomatematics of Madura Coastal Culture. In Al-Ishlah Jurnal Pendidikan. https://doi.org/10.35445/alishlah.v15i2.3024

Setyani, G. D., & Kristanto, Y. D. (2020). A Case Study of Promoting Informal Inferential Reasoning in Learning Sampling Distribution for High School Students. In Sjme (Supremum Journal of Mathematics Education). https://doi.org/10.35706/sjme.v4i1.3132

Shaheema, A., Azar, A. S., & Ahmad, A. (2023). The Key Connection Between the Elements of Self-Regulated Learning (SRL) and Mathematics Performance: Literature Review. In Education Quarterly Reviews. https://doi.org/10.31014/aior.1993.06.03.770

Sumliyah, S., Rustika, P., & Firmansyah, A. (2020). Efforts to Improve the Ability of Self Efficacy Students With the AIR Learning Model. In Eduma Mathematics Education Learning and Teaching. https://doi.org/10.24235/eduma.v9i1.5621

Utami, I. Q., Hwang, W., & Hariyanti, U. (2024). Contextualized and Personalized Math Word Problem Generation in Authentic Contexts Using Generative Pre-Trained Transformer and Its Influences on Geometry Learning. In Journal of Educational Computing Research. https://doi.org/10.1177/07356331241249225

Vhantoria, F. (2021). Scafolding dalam Menyelesaikan Soal Eksponen Mahasiswa Ditinjau dari Teori Brodie. Eksponen, 11(2), 1–5.

Vorensky, S. (2019). Elementary School Teachers' Beliefs About Technology and Instructional Choices in Teaching Math. https://doi.org/10.3102/1434457

Zhou, D., Liu, J., & Liu, J. (2020). On the Different Effects of Teacher–student Rapport on Urban and Rural Students' Math Learning in China: An Empirical Study. In Psychology in the Schools. https://doi.org/10.1002/pits.22446