

ANALYSIS OF STUDENTS' DIFFICULTIES IN SOLVING ESSAY PROBLEMS BASED ON MATHEMATICAL CONNECTIONS REVIEWED BY SELF-CONFIDENCE

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ABSTRACT

This study aims to identify and describe students' difficulties in solving essay-type problems based on their mathematical connection abilities in relation to self-confidence. This research employs a qualitative approach using a case study method. The subjects of the study were nine eighth-grade students at SMPN 40 Pekanbaru. Data were collected through triangulation techniques, including a mathematical connection ability test, a self-confidence questionnaire, and structured interviews. Data analysis consisted of data reduction, data display, and conclusion drawing. The results show that students with high self-confidence are able to solve problems well and appropriately connect mathematical concepts. Students with moderate self-confidence still experience difficulties in determining correct solutions, lack accuracy in calculations, and do not complete solution steps thoroughly. Meanwhile, students with low self-confidence face difficulties in almost all aspects, particularly in understanding and applying mathematical concepts and in solving verbal problems. These findings indicate that self-confidence plays an important role in students' mathematical connection abilities. Therefore, learning strategies that can enhance students' self-confidence are needed to optimally develop their mathematical connection skills.

Keywords: mathematical connection ability; self-confidence; student difficulties

ABSTRAK

Penelitian ini bertujuan untuk mengidentifikasi dan mendeskripsikan kesulitan siswa dalam menyelesaikan soal uraian berdasarkan kemampuan koneksi matematis yang ditinjau dari self-confidence. Penelitian menggunakan pendekatan kualitatif dengan metode studi kasus. Subjek penelitian adalah sembilan siswa kelas VIII SMPN 40 Pekanbaru. Pengumpulan data dilakukan melalui triangulasi, yaitu tes kemampuan koneksi matematis, angket self-confidence, dan wawancara terstruktur. Analisis data meliputi reduksi data, penyajian data, serta penarikan kesimpulan. Hasil penelitian menunjukkan bahwa siswa dengan self-confidence tinggi mampu menyelesaikan soal dengan baik serta mengaitkan konsep matematis secara tepat. Siswa dengan self-confidence sedang masih mengalami kesulitan dalam menentukan solusi, kurang teliti dalam perhitungan, dan belum menyelesaikan langkah secara tuntas. Sementara itu, siswa dengan self-confidence rendah mengalami kesulitan pada hampir seluruh aspek, terutama dalam memahami dan menerapkan konsep matematika serta menyelesaikan soal verbal. Temuan ini menunjukkan bahwa self-confidence berperan penting dalam kemampuan koneksi matematis siswa. Oleh karena itu, diperlukan strategi pembelajaran yang dapat meningkatkan kepercayaan diri siswa agar kemampuan koneksi matematis berkembang secara optimal.

Kata kunci: kemampuan koneksi matematis; kesulitan siswa; self confidence



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Introduction

Mathematics is a vital field of study taught to students from elementary school through university. Learning mathematics helps students navigate various challenges in everyday life, making it crucial to understand the concepts involved (Agbata et al., 2024; Savriliansa et al., 2020; Wardani et al., 2024). In addition, mathematics does not only focus on memorizing formulas, but also on the ability to build relationships between mathematical ideas, because each concept is interrelated and must be understood in a structured manner (Choiriah et al., 2025; Sholekah et al., 2017).

In mathematics learning, students are expected to possess several important skills, one of which is mathematical connection skills. Based on learning standards, students are expected to be able to solve problems, communicate, reason, and relate mathematical concepts to various contexts (Choiriah et al., 2025; Maulyda, 2020). Mathematical connection ability is the ability to connect ideas in mathematics, relate them to other fields, and apply them in everyday life (Aszahra et al., 2024). With this ability, students are expected to be able to understand mathematics more meaningfully.

However, in reality, students' mathematical connection skills are still relatively low. This is evident in their difficulty connecting learned concepts to the problems they face, resulting in a low quality of mathematics learning (Siagian, 2016). In addition, low mathematical connection skills cause students to experience obstacles in utilizing previously learned concepts to solve problems (Laman et al., 2025; Warih et al., 2016).

Students' difficulties in learning mathematics are also evident when they solve problems, particularly descriptive problems. Descriptive problems provide students with the opportunity to freely express their ideas and solve problems (Rohim, 2019). However, many students experience difficulties in solving these problems, such as difficulty in understanding the problem, applying the concept, being less careful in calculations, and not completing the calculation process completely (Maheswari et al., 2025; Retnawati et al., 2025). This condition shows that there is a gap between learning expectations and the reality that occurs in the field.

One factor that affects students' problem-solving ability is self-confidence, which refers to their belief in their own capacity to find solutions. Students with high self-confidence generally demonstrate better problem-solving skills, whereas those with moderate and low self-confidence tend to encounter various difficulties (Diah et al., 2023; Malinda & Minarti, 2018; Putra & Widyawati, 2025). Learning independence is one of the factors that determines student success in learning (Kusniawati et al., 2020). In addition, students with low self-confidence tend to feel doubtful, afraid of making mistakes, and lack confidence in solving problems (Nurafni & Pujiastuti, 2019; Rahmawati, 2025).

If this condition is not addressed, it can impact students' low ability to solve math problems, particularly those related to mathematical connection skills. Therefore, research is needed to identify students' difficulties in solving descriptive problems based on mathematical connection skills, as assessed by their level of self-confidence.

Based on the description, the aim of this study is to identify and describe students' difficulties in solving descriptive questions based on mathematical connection abilities in terms of self-confidence levels, namely high, medium, and low categories.

Research Methods

This research uses a qualitative approach with a case study design (Pirmanto, 2016). This approach was chosen to gain a deeper understanding of students' difficulties in solving mathematical connection-based essay problems, as viewed from their self-confidence levels in a real-life learning context. The research was conducted at SMPN 40 Pekanbaru in the even semester of the 2023/2024 academic year. The subjects were 33 students of class VIII B. Subjects were selected using a purposive sampling technique, taking into account students' self-confidence levels. Self-confidence grouping was based on questionnaire results analyzed using score categories, namely Table 1.

Table 1. Self-confidence categories

Number	Category	Value Range
1	high self-confidence	$X \geq 74,12$
2	moderate self-confidence	$55,14 < X < 74,12$
3	low self-confidence	$X \leq 55,14$

Based on these categories, nine students were selected as the primary research subjects, consisting of three students in each category. This number was chosen considering the characteristics of qualitative research, which emphasizes data depth, allowing researchers to conduct more in-depth analysis of each subject. The instruments used in this study included questionnaires, tests, and interviews.

1. Self-confidence Questionnaire

This questionnaire, consisting of 24 statements, is used to measure students' self-confidence. It aims to categorize students into high, medium, and low self-confidence categories.

2. Mathematical Connection Ability Test

This test is in the form of essay questions consisting of three items. This test measures students' mathematical connection abilities, which include three indicators:

- a. Relationships among mathematical concepts.
- b. Relationships between mathematics and other fields of study,
- c. Relationships between mathematics and real-life situations.

3. Interviews

Structured interviews were conducted to gather more in-depth information about the difficulties students experienced in solving the problems and to strengthen the results of the questionnaires and tests.

Data collection was conducted using triangulation techniques, namely questionnaires, tests, and interviews. The questionnaire was used initially to determine self-confidence categories. Subsequently, a test was administered to measure students' mathematical connection skills. Interviews were conducted after

the test to clarify students' answers and identify any difficulties they experienced in greater depth.

The research instrument was validated by three experts using the Aiken index to ensure its validity (Retnawati, 2016). The validation results indicate that the instrument is valid and therefore suitable for use in research. Following the validation process, a pilot test was conducted to determine its reliability before use on research subjects. This pilot test aims to ensure that the instrument consistently measures the aspects being studied. Data analysis was carried out qualitatively through three stages, namely data reduction, data presentation, and drawing conclusions.

1. Data reduction was carried out by selecting, focusing, and grouping data based on self-confidence categories and indicators of mathematical connection ability.
2. Data presentation was carried out in the form of tables and narrative descriptions to facilitate understanding of the research results.
3. Conclusions were drawn by interpreting the patterns that emerged from the data to illustrate students' difficulties in each self-confidence category.

Results and Discussion

Information regarding student self-confidence was obtained through a questionnaire consisting of 24 statements after a validation process. Each student's score was determined based on the questionnaire results, which were processed according to scoring guidelines. Based on the scores obtained, students were grouped into three levels: high, medium, and low self-confidence. Nine students were selected for interviews from a total of 33 students. The selection was made by selecting each student based on their various levels of self-confidence in Table 2.

Tabel 2. Research Data Subjects Interviewed

Number	Inisial Subjek	Skor	Tingkat Self Confidence
1	S-23	72	High
2	S-24	76	High
3	S-25	72	High
4	S-4	69	Currently
5	S-19	63	Currently
6	S-30	61	Currently
7	S-15	52	Low
8	S-18	52	Low
9	S-26	52	Low

Table 2 shows the grouping of subjects based on their self-confidence levels: high, medium, and low. This division provides an initial overview of the variation in student characteristics that forms the basis for further analysis. Each category is represented proportionally, making it easier for researchers to compare student difficulties at each level of self-confidence in depth in Table 3.

Table 3. Data on Mathematical Connection Ability Scores According to the Self-Confidence Level of Research Subjects

Number	Subject Initials	Self Confidence Level	Mathematical Connection Ability Questions			
			1	2	3	Score
1	S-23	High	4	4	4	12
2	S-24	High	4	4	3	11
3	S-25	High	4	4	4	12
4	S-4	Currently	4	2	3	9
5	S-19	Currently	3	2	4	9
6	S-30	Currently	3	2	4	9
7	S-15	Low	1	2	1	4
8	S-18	Low	1	1	2	4
9	S-26	Low	1	1	2	4

Table 3 shows that students' mathematical connection ability scores tended to align with their self-confidence levels. Students with high self-confidence achieved maximum scores, while students with moderate and low self-confidence showed a decrease in scores. This indicates that self-confidence influences the accuracy and completeness of essay problem solving in Table 4.

Table 4. Data on Mathematical Connection Ability Based on the Self-Confidence Level of Research Subjects

Number	Subject Initials	Self Confidence Level	Mathematical Connection Ability Indicator		
			Connections between mathematical concepts	Connections with scientific disciplines	Connection with the real world
1	S-23	High	Able	Capable	Capable
2	S-24	High	Able	Capable	Capable
3	S-25	High	Able	Capable	Capable
4	S-4	Currently	Able	Less Capable	Capable
5	S-19	Currently	Able	Less Capable	Capable
6	S-30	Currently	Able	Less Capable	Capable
7	S-15	Low	Able	Less Capable	Unable
8	S-18	Low	Not able	Incapable	Unable
9	S-26	Low	Not able	Incapable	Unable

Table 4 shows differences in mathematical connection skills for each indicator based on self-confidence levels. Students with high self-confidence were proficient in all indicators, while students with moderate self-confidence struggled with cross-disciplinary connections. Students with low self-confidence struggled with almost all indicators, particularly in connecting mathematical concepts to real-world contexts.

High Self Confidence

1. Subject with Initials S-23

The individual with the initials S-23 successfully solved the problem optimally and accurately identified alternative solutions. In question 1, the research subject demonstrated superior comprehension of mathematical concepts and was able to solve the mathematical concept effectively. In question 2, the student was also able to make complete and accurate connections between mathematics and other disciplines. For question 3, the research subject experienced no difficulty in establishing accurate and comprehensive mathematical connections between mathematics and real-world situations.

2. Subject with Initials S-24

The individual with the initials S-24 is skilled at providing accurate answers to questions and reaching the correct solution. In question 1, the student demonstrates a strong conceptual understanding of mathematics. In question 2, the student can accurately connect mathematics to other disciplines. In question 3, the student can connect mathematics to everyday situations, although the student is slightly less careful in performing calculations.

3. Subject Initials S-25

Students with the initials S-25 are able to provide accurate answers and reach appropriate solutions. In question 1, the student demonstrates good conceptual understanding when answering a math question. In question 2, the student can accurately correlate mathematics with other disciplines. In question 3, the student encounters no difficulty in establishing accurate and comprehensive connections between mathematics and real-world situations.

Students with high self-confidence are able to meet all indicators of mathematical connection skills. They can accurately connect mathematical concepts, relate mathematics to other disciplines, and apply them correctly in everyday life contexts. These findings indicate that students with high self-confidence tend to be confident in using their knowledge, thus being more confident in exploring problem-solving strategies. This aligns with Malinda & Minarti, (2018) finding that higher self-confidence leads to better mathematical connection skills. Furthermore, students in this category demonstrated accuracy in their calculations and were able to complete the problem to the final stage. It can be concluded that the students did not experience any difficulties because, overall, they were able to solve the problem successfully.

Moderate Self Confidence

1. Subject Initial S-4

The student with the initial S-4 had a good understanding of questions 1 and 3, but made a few errors on question 2. In question 1, the student demonstrated good conceptual understanding in answering the math problem. In question 2, the student had difficulty solving algorithms and was unable to connect mathematics to other subjects. In question 3, the student was able to apply mathematics in everyday life but was less precise in her calculations.

2. Subject with Initials S-19

The student with the initials S-19 had a good understanding of questions 1 and 3, but made a few errors on question 2. In question 1, the student demonstrated

good conceptual understanding in answering the math problem, but there were still a few errors in the final calculation of the answer. Question 2 indicated that the student had difficulty solving the algorithm and was unable to analyze the mathematical relationships across disciplines. In question 3, the research subject successfully applied mathematical concepts in a practical, everyday context competently and accurately.

3. Subject with initials S-30

Students with initials S-30 demonstrated a solid understanding of questions 1 and 3, although they made a number of errors in question 3. In question 1, the student demonstrated a strong conceptual understanding in answering the math problem, although there were still a few errors in the answer. In question 2, the student had difficulty solving the algorithm and was unable to connect mathematics to other subjects. In question 3, the student was able to apply mathematical concepts to everyday life appropriately and accurately.

Students with moderate self-confidence generally meet the indicators for connecting mathematical concepts and their connections to everyday life, but experience difficulties connecting them to other disciplines. Furthermore, frequent errors include inaccurate calculations and incomplete completion of the problem. This indicates that students have a fairly good understanding of the concept, but lack the necessary self-confidence to develop a solution strategy. Cognitively, students understand the concept, but affectively, they still experience doubts that impact their performance. This is in line with Pramudita et al., (2026); Zukhriya & Wijayanti, (2024) who stated that students with moderate self-confidence have not shown optimal abilities in solving mathematical problems.

Low Self Confidence

1. Subject Initial S-15

A student with the initial S-15 was only able to understand a small portion of the problem presented in the test. The student had difficulty finding the answers to questions 1 and 3. In question 2, the student was able to connect the math question to other fields of study, but the student did not complete the calculation until the end.

2. Subject with initials S-18

Students with initials S-18 were only able to understand a small portion of the problem presented in the questions. They had difficulty finding solutions to questions 1 and 2. On question 3, they were able to perform mathematical operations in everyday life, but did not complete the calculations.

3. Subject with the Initials S-26

Students with the initials S-26 only managed to grasp a few points of the problem posed in the evaluation. The student encountered difficulties in solving problems 1 and 2. Regarding problem 3, the student demonstrated the ability to integrate mathematical concepts into a practical context, however, he did not complete the calculation process to the final stage and still encountered errors in his calculations.

Students with low self-confidence experience difficulties in almost all indicators of mathematical connection skills. They tend to be unable to connect mathematical concepts, have difficulty relating mathematics to other fields, and are

unable to apply concepts appropriately in everyday life. These difficulties include an inability to understand problems, errors in determining solution steps, and failure to complete calculations. This condition indicates that low self-confidence impacts not only affective aspects but also students' cognitive abilities in processing information. This is in line with Heryanto et al., (2022); Nurhaswinda, (2025); Zulfera & Yusri, (2017) who stated that difficulties in learning mathematics are characterized by the inability to understand conceptual relationships and solve problems appropriately.

According to the findings of the data analysis conducted, students' proficiency in handling questions regarding mathematical connection skills varies. Different levels produce answers with varying degrees of difficulty. These differences in answers are caused by various factors, one of which is student self-confidence.

According to the findings obtained, students with a high level of self-confidence succeeded in solving problems related to the ability to connect mathematical concepts well and correctly, so it can be concluded that they did not experience obstacles in applying concepts, principles, and solving verbal problems.

Students with moderate self-confidence struggle to solve problems that test mathematical connection skills, particularly in correctly applying principles. Errors arise because learners are not careful when performing calculations and fail to complete the calculation sequence. Furthermore, students also encounter difficulties when analyzing problems presented in text form, where they lack accuracy in integrating mathematical understanding with other scientific disciplines.

Students with low self-confidence experience various difficulties, such as difficulty applying concepts and principles and difficulty solving verbal problems. Difficulty applying concepts means students cannot read the content of the question and do not know the procedures needed to answer it. Difficulty applying principles means performing calculations but not getting results and experiencing calculation errors. Difficulty in verbal problem solving means the inability to create mathematical models and connect mathematics to other sciences or real-world situations.

Conclusion and Suggestion

This study shows that self-confidence plays a significant role in students' mathematical connection skills. Students with high self-confidence were able to meet all mathematical connection indicators, including connections between concepts, connections with other disciplines, and applications in everyday life. Meanwhile, students with moderate self-confidence were only able to meet some of the indicators and still experienced procedural errors and inaccuracies. Meanwhile, students with low self-confidence were unable to demonstrate optimal mathematical connection skills across almost all indicators.

The main findings of this study confirm that affective aspects, particularly self-confidence, not only influence learning attitudes but also directly contribute to the cognitive process of building mathematical connections. Thus, this study contributes to strengthening the importance of integrating cognitive and affective

aspects in mathematics learning, particularly in efforts to improve students' mathematical connection skills.

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