EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2025. 164-178
DOI: https://doi.org/10.24127/emteka.v6i1.10662

e-ISSN 2746-5594
p-ISSN 2746-5608

MATHEMATICAL CRITICAL THINKING SKILLS OFSEVENTH-GRADE STUDENTS IN SOLVING FRACTION PROBLEMS

Sugianto [1*]

[1*]Institut Agama Islam Dar Aswaja Rokan Hilir, Pekanbaru, Indonesia
** Corresponding author.Jl. Ibadah Syech Madlawan, Sungai Pinang, Kecamatan Kubu Babussalam, Kabupaten Rokan Hilir, Riau, 28991*

E-mail: sugiantoramlan90@gmail.com

Received November 27, 2025; Received in revised form February 25, 2026; Accepted March 17, 2026

ABSTRACT
Mathematical critical thinking skills (MCTS) constitute an essential competence in mathematics learning, as they assist students in understanding concepts, analyzing problems, and drawing logical conclusions. However, various studies indicate that students' mathematical critical thinking skills remain at a suboptimal level, particularly in the topic of fractions, which serves as a foundational concept for understanding more advanced mathematical ideas. This study aims to describe the mathematical critical thinking skills of seventh-grade students at MTs Al-Irsyad Riau in learning fractions based on the indicators of interpretation, analysis, evaluation, and inference. This research employed a descriptive method with a quantitative approach supported by qualitative analysis of students' responses. The participants consisted of 33 seventh-grade students. Data were collected through an essay test comprising four questions designed based on indicators of mathematical critical thinking skills. The findings revealed that students' mathematical critical thinking skills were at a moderate level, with an achievement percentage of 49.24%. Analysis based on the indicators showed that the skills of interpretation, analysis, evaluation, and inference were all within the moderate category, with the highest achievement found in the inference indicator. These findings indicate that students possess basic critical thinking abilities; however, their application in solving mathematical problems still requires further strengthening. Therefore, mathematics instruction needs to be designed to encourage reasoning activities, problem solving, and mathematical discussion in order to develop students' critical thinking skills more optimally.
Keywords: *analysis; mathematical critical thinking skills; fractions*

ABSTRAK
Keterampilan berpikir kritis matematis (KBKM) merupakan salah satu kemampuan penting dalam pembelajaran matematika karena berperan dalam membantu siswa memahami konsep, menganalisis permasalahan, serta menarik kesimpulan secara logis. Namun, berbagai penelitian menunjukkan bahwa kemampuan berpikir kritis matematis siswa masih berada pada tingkat yang belum optimal, khususnya pada materi pecahan yang menjadi dasar bagi pemahaman konsep matematika lanjutan. Penelitian ini bertujuan untuk mendeskripsikan keterampilan berpikir kritis matematis siswa kelas VII MTs Al-Irsyad Riau pada materi pecahan berdasarkan indikator interpretasi, analisis, evaluasi, dan inferensi. Penelitian ini menggunakan metode deskriptif dengan pendekatan kuantitatif yang didukung analisis kualitatif terhadap jawaban siswa. Subjek penelitian berjumlah 33 siswa kelas VII. Data dikumpulkan melalui tes uraian yang terdiri dari empat soal yang dirancang berdasarkan indikator keterampilan berpikir kritis matematis. Hasil penelitian menunjukkan bahwa KBKM siswa berada pada kategori cukup dengan persentase capaian sebesar 49,24%. Analisis berdasarkan indikator menunjukkan bahwa kemampuan interpretasi, analisis, evaluasi, dan inferensi seluruhnya berada pada kategori cukup, dengan capaian tertinggi pada indikator inferensi. Temuan ini menunjukkan bahwa siswa telah memiliki kemampuan dasar dalam berpikir kritis, namun penerapannya dalam menyelesaikan permasalahan matematis masih memerlukan penguatan. Oleh karena itu, pembelajaran matematika perlu dirancang untuk mendorong aktivitas penalaran, pemecahan masalah, serta diskusi matematis guna mengembangkan keterampilan berpikir kritis siswa secara lebih optimal.

EMTEKA: Jurnal Pendidikan Matematika
Volume 7, No. 1, 2025. 164-178
DOI: https://doi.org/10.24127/emteka.v6i1.10662

e-ISSN 2746-5594
p-ISSN 2746-5608

***Kata kunci**:* analisis; keterampilan berpikir kritis matematis; pecahan

Introduction

Mathematical critical thinking skills (MCTS) are part of Higher Order Thinking Skills (HOTS) and play an important role in learning in the twenty-first century. According to Nurhasanah et al. (2024) and Burhanuddin et al. (2025) critical thinking skills refer to an individual's ability to identify, relate, analyze, and evaluate the information obtained, and subsequently use it to solve problems and make appropriate and rational decisions. Munawwarah et al. (2020) and Prajono et al. (2022) explain that through mathematical critical thinking skills, students are not only required to master computational procedures but also to understand the meaning of concepts, analyze situations or problems, evaluate the effectiveness of solution strategies, and draw logical conclusions based on mathematical evidence. Furthermore Amanda et al., (2020) state that in mathematics learning at school, critical thinking skills function as a fundamental basis for generating initial ideas in problem solving and for engaging in mathematical reasoning. Critical thinking is the ability to analyze, evaluate, and interpret information in a rational, objective, and systematic manner before drawing conclusions or making decisions (Vahlia et al., 2021).

Numerous studies indicate that students' mathematical critical thinking skills (MCTS) in Indonesia remain relatively low. Several studies report that students still experience difficulties in analyzing, evaluating, and drawing conclusions when solving mathematical problems (Elmawati & Juandi, 2022; Fitri et al., 2023;Mursidah, 2023). Results from international assessments such as PISA 2022 show that most students are only able to solve routine problems that follow familiar procedural steps. Umbara et al., (2025) explain that many students still face difficulties when dealing with problems that require logical reasoning, in-depth analysis, and the application of concepts in more complex contexts.

Fractions are one of the topics that frequently pose difficulties for students in mathematics learning (Syarifuddin, 2019; Nurussama & Hermanto, 2022; Landu, 2024). Learning fractions requires students to understand the relationship between parts and wholes and to perform fraction operations conceptually (Safitri et al, 2025; Gampu & Ambarita ,2025). However, in practice many students still struggle to interpret the meaning of fractions, carry out operational procedures correctly, and explain the reasoning behind the solution steps they use. These difficulties are closely related to the indicators of mathematical critical thinking, namely interpretation, analysis, and evaluation (Hariyani et al.,2022). In addition, other studies show that students' errors in fraction topics include errors in reading the problem, understanding the problem, transforming information, process skills, and writing the final answer (Meirina, 2024; Dewi, N. K. et al., 2020). This condition indicates that students' mathematical critical thinking skills, particularly in the indicators of interpretation, analysis, evaluation, and inference, have not yet developed optimally (Faiziyah & Priyambodho, 2022).

e-ISSN 2746-5594
p-ISSN 2746-5608

In addition to factors related to students themselves, the learning process in the classroom also plays a significant role in the low level of critical thinking skills (Sutarsa & Puspitasari, 2021). Critical thinking skills are essential, as they can be used to solve problems and serve as a basis for making sound and appropriate decisions (Kusniawati at al., 2020). Learning models that remain teacher-centered, the use of routine problems, and the limited learning activities that encourage students to argue and reflect mathematically restrict students' opportunities to think critically (Suryani & Haryadi, 2020). As a result, students' skills in interpreting, evaluating, and communicating mathematical concepts have not developed well.

Several previous studies have also shown that students' mathematical critical thinking skills remain at a low level across various learning contexts. At the elementary school level, Sahda et al. (2025) found that students' critical thinking skills in solving word problems related to fractions in Grade V were categorized as low. Similar findings were reported by Lusiana et al. (2022) who concluded that students' mathematical critical thinking skills in solving fraction division problems at SD Negeri Tegalayu Surakarta were generally low. At the junior secondary school level, Hikmah and Kartika (2022) as well as Agus and Purnama (2022) also reported that students' mathematical critical thinking skills were still categorized as low. Even at the higher education level, research conducted by Anugraheni and Sartono (2022) showed that the mathematical critical thinking skills of students in the Primary School Teacher Education Program at Universitas Kristen Satya Wacana were still not optimal. Similar results were also reported by Anggraini et al. (2022) and Katherina Estherika and Setianingsih (2022) who found that approximately 90% of students at SMP Negeri 1 Bengkulu City demonstrated mathematical critical thinking skills in the low category.

These findings indicate that the low level of mathematical critical thinking skills is not limited to a particular educational level but represents a consistent issue across various levels of education. Therefore, learning approaches that encourage students' active engagement in reasoning and problem-solving processes are needed. Several learning models considered relevant for developing mathematical critical thinking skills include Problem-Based Learning, Inquiry Learning, and Realistic Mathematics Education, as they emphasize exploratory activities, problem analysis, and the connection between mathematical concepts and real-life contexts.

Furthermore, studies that specifically examine mathematical critical thinking skills in the topic of fractions remain relatively limited. In fact, fractions are a fundamental concept in mathematics, as they form the basis for understanding various advanced topics such as decimals, percentages, and ratios. This limitation indicates that there are still relatively few studies that analyze students' mathematical critical thinking skills based on specific indicators in fraction topics, particularly at the Madrasah Tsanawiyah (MTs) level.

Based on these considerations, this study was conducted to provide an empirical description of students' achievement in each indicator of mathematical critical thinking skills, namely interpretation, analysis, evaluation, and inference in fraction topics. The results of this study are expected to provide more comprehensive information regarding the profile of students' critical thinking

e-ISSN 2746-5594
p-ISSN 2746-5608

skills and serve as a basis for teachers in designing more effective mathematics learning strategies to develop students' critical thinking abilities.

Research Methods

This study employed a descriptive method with a quantitative approach. This approach aimed to describe the level of students' mathematical critical thinking skills in fraction topics based on the scores obtained from the test results. The collected data were analyzed to illustrate students' achievement levels for each indicator of mathematical critical thinking skills.

The research was conducted at MTs Al-Irsyad Riau during the first semester of the 2025/2026 academic year. The research participants consisted of 33 seventh-grade students. The sampling technique used was total sampling, meaning that all students in the class were included as research participants. This technique was selected because the number of students in the class was relatively limited, allowing all members of the population to be involved in order to obtain a more comprehensive description of students' mathematical critical thinking skills in fraction topics.

The research implementation consisted of several stages. The first stage was the preparation stage, which included developing the research instrument in the form of a mathematical critical thinking skills test on fraction topics and preparing the scoring rubric. The second stage was the implementation stage, during which the test was administered to students according to the predetermined schedule. The third stage was the data processing stage, which involved scoring students' answers based on the prepared scoring rubric. The final stage was the data analysis and conclusion stage, in which the obtained scores were analyzed to determine the level of students' mathematical critical thinking skills for each indicator.

The research instrument used in this study was an essay-type test consisting of four questions related to fraction topics. Each question was designed to measure different indicators of mathematical critical thinking skills. The first question measured interpretation skills, namely students' ability to understand and interpret the information presented in the problem. The second question measured analysis skills, referring to students' ability to identify relevant information and determine appropriate solution strategies. The third question measured evaluation skills, which refer to students' ability to review solution procedures and examine the correctness of the answers. The fourth question measured inference skills, namely students' ability to draw logical conclusions based on the solution process they had carried out.

Data collection was conducted through the direct administration of the test to the students. All student responses were collected and assessed using a scoring rubric that had been prepared beforehand so that each indicator of mathematical critical thinking skills could be measured systematically.

Before being used for data collection, the research instrument underwent a validation process through expert judgment. This process aimed to ensure the alignment between the test items and the indicators of mathematical critical thinking skills as well as their suitability with the fraction material for seventh-grade students. The validation process was conducted by experts or lecturers in

e-ISSN 2746-5594
p-ISSN 2746-5608

the field of mathematics education. Suggestions and feedback from the validators were used as the basis for revising the instrument so that it would be appropriate for use in the study.

The construction of the test items considered the alignment between the tested material, the intended cognitive level, and the form of mathematical reasoning to be measured in each indicator of mathematical critical thinking skills. In addition, the questions were designed using contexts related to everyday life in the Islamic boarding school environment, such as kitchen activities and students' food consumption needs. The selection of this context was intended to present situations that are close to students' daily experiences so that mathematics learning becomes more meaningful. Through familiar contexts, students are expected to better understand the problems presented and relate mathematical concepts to real situations they encounter. A description of the test items and their relation to the indicators of mathematical critical thinking skills is presented in Table 1.

Table 1. Test Items and Indicators of Mathematical Critical Thinking Skills

No	Indicator	Question
1	Interpretation	At Al-Irsyad Islamic Boarding School, the kitchen prepares one sack of rice weighing 20 kg for the students' meals for one day. During breakfast, 1/4 of the sack is used. For lunch, 2/5 of the sack is used, while the remainder is used for dinner. How much of the sack of rice remains for dinner? How many kilograms are used for breakfast, lunch, and dinner?
2	*Analysis*	At Al-Irsyad Islamic Boarding School, the kitchen prepares bread for the students every week. To make one tray of bread, 3/4 kg of flour is required. The kitchen prepares only 6 kg of flour. Each tray of bread is cut into five equal pieces for distribution to the students. How many trays of bread can be made from 6 kg of flour? How many pieces of bread will be obtained? Are these pieces sufficient for 35 students if each student receives one piece? Explain your reasoning based on the calculation results.
3	Evaluation	At Al-Irsyad Islamic Boarding School, the kitchen prepares banana dessert (kolak) for breaking the fast. Each pot requires 1½ liters of coconut milk. On Friday, the kitchen prepares six pots of kolak. A student named Hasan states: "One pot needs 1½ liters, so six pots means six times 1 liter plus only ½ liter." Hasan writes: 6 × 1½ = 6 + ½ = 6½. Hasan concludes that the kitchen needs 6½ liters of coconut milk. Is Hasan's calculation correct? Explain the error and show the correct method of calculation.
4	*Inference*	Kemal buys two pieces of bread of the same size. From the first bread he eats 1/4, and from the second bread he eats 2/4. Kemal says, "I have eaten one whole bread." Is

e-ISSN 2746-5594
p-ISSN 2746-5608

Kemal's statement correct? Explain your reasoning.

Students' answers were assessed using an analytic scoring rubric developed based on the indicators of mathematical critical thinking skills, namely interpretation, analysis, evaluation, and inference. Each test item was scored on a scale of 0–4, with the highest score indicating a higher level of mastery of the indicator. The use of this scale aimed to provide a more objective assessment of both the process and the results of students' problem-solving**.**

Table 2. Scoring Rubric for Mathematical Critical Thinking Skills

Score	Assessment Criteria
4	Correct answer, complete solution steps, and logical explanation consistent with the concept used.
3	Correct answer but the solution steps are incomplete or the explanation lacks detail.
2	The solution process is partially correct, but there are conceptual or computational errors.
1	The answer is inaccurate and the solution steps are unclear or inconsistent with the concept used.
0	No answer or the response does not correspond to the problem.

The scoring rubric was applied to each indicator of mathematical critical thinking skills measured in this study. Interpretation was assessed based on students' ability to understand and interpret the information presented in the problem. Analysis was measured through students' ability to identify relevant information and determine appropriate solution strategies. Evaluation referred to students' ability to assess the correctness of procedures or calculation results accompanied by logical reasoning. Meanwhile, inference was assessed based on students' ability to draw appropriate conclusions based on the results of calculations and mathematical reasoning.

The scores for each indicator were then summed to obtain the total score of students' mathematical critical thinking skills. These scores were subsequently processed and analyzed to describe students' critical thinking ability in fraction topics.

The research data were analyzed using descriptive quantitative analysis techniques. The analysis was conducted by assigning scores to each student response based on the predetermined scoring rubric for each test item. The obtained scores were then calculated to determine students' achievement levels for each indicator of mathematical critical thinking skills. These scores were subsequently converted into percentages to represent students' level of achievement. The analysis results were then classified into several ability categories to provide an overview of students' mathematical critical thinking skills in fraction topics. The processed data were presented in the form of tables and percentages so that the distribution of students' abilities could be displayed systematically.

The classification of data in this study referred to the categories of mathematical critical thinking skills proposed by Rahmawati et al. (2023). In their study, students' mathematical critical thinking skills were categorized into five levels: very high, high, moderate, low, and very low. This categorization was used

e-ISSN 2746-5594
p-ISSN 2746-5608

to facilitate the interpretation of the research findings and to provide a more systematic overview of students' ability levels based on the obtained scores. The score ranges for each category were determined based on the division of intervals from 0 to 100, where each interval represented a different level of achievement. Through this classification, students' mathematical critical thinking skills could be analyzed and interpreted in a more structured manner. The classification of students' scores is presented in Table 3.

Table 3. Classification of Students' Mathematical Critical Thinking Skills

Classification	Score Range
Very Low	0 – 20
Low	21- 40
Moderate	41 – 60
High	61 – 80
Very high	81 – 100

Results and Discussion

Contains This section presents the results of the analysis of students' Mathematical Critical Thinking Skills (MCTS) among seventh-grade students at MTs Al-Irsyad Riau on the topic of fractions. The analysis was conducted based on the assessment of students' responses to the test instrument that had been administered. The results were then classified into five levels of ability: very high, high, moderate, low, and very low. This classification aims to provide a systematic overview of students' mathematical critical thinking ability. The distribution of students' ability levels is presented in Table 4.

Table 4. Distribution of Students' Mathematical Critical Thinking Skills

Classification	Number of Students	Percentage
Very High	1	3,03
High	10	30,30
Moderate	12	36,36
Low	7	21,21
Very Low	3	9,09
Total	33	100

Table 4 show the distribution of students' mathematical critical thinking skills across five categories. In general, most students fall into the moderate and high categories, while only a small number of students reach the very high category. This finding is consistent with the results reported by Defiyanti & Sumarni (2019) in the journal *Phenomenon*, which found that the average critical thinking ability of students was 62.6, categorized as moderate.

The moderate category was the most dominant, accounting for 36.36% of the students. This finding indicates that the majority of students have developed mathematical critical thinking skills at an intermediate level. The high category followed with a percentage of 30.30%, suggesting that several students have begun to demonstrate more consistent achievement across the critical thinking indicators. Meanwhile, the low category accounted for 21.21%, indicating that some students still experience difficulties in meeting the demands of critical thinking in fraction

e-ISSN 2746-5594
p-ISSN 2746-5608

topics. The very low category represented 9.09% of the students, reflecting a small group that requires additional instructional support.

The very high category had the smallest proportion, at 3.03%, indicating that only a few students were able to achieve a high level of critical thinking ability. Overall, this distribution pattern suggests that students' mathematical critical thinking skills still require further strengthening through learning approaches that facilitate reasoning, problem solving, and structured mathematical discussions. The Creative Problem Solving learning model is a variation of problem-based learning that employs systematic techniques to organize creative ideas in order to solve a problem (Oktaviana et al., 2017).

Students' mathematical critical thinking skills were further analyzed based on four main indicators: interpretation, analysis, evaluation, and inference. Each indicator represents students' ability to apply critical thinking processes when solving problems related to fractions. The results of the analysis, including the average scores and ability classifications, are presented in Table 5.

Table 5. Analysis of Mathematical Critical Thinking Skills Based on Each Indicator

No	Indicator	Score	Classification
1	Interpretation	41,75	Moderate
2	Analysis	42,50	Moderate
3	Evaluation	55,25	Moderate
4	Inference	57,50	Moderate
	Average	49,24	Moderate

The results shown in Table 5 and Figure 2 indicate that students' mathematical critical thinking skills fall within the moderate category, with an average score of 49.24. This finding suggests that students possess a basic capacity for critical thinking, although its application in solving mathematical problems is not yet fully stable. In general, students are able to recognize important information and attempt to organize solution steps; however, the quality of their reasoning varies.

Overall, students' critical thinking skills appear to be at a developing stage. Students tend to be capable of solving procedural problems but are not yet fully able to provide strong reasoning, evaluate the appropriateness of solution strategies, or consider alternative solutions. This condition may indicate that mathematics instruction is still largely focused on routine exercises, limiting students' opportunities to develop analytical and reflective thinking skills.

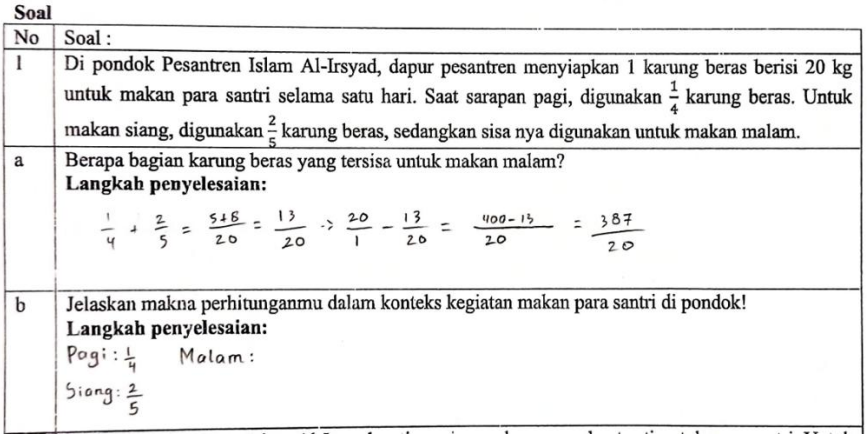
These findings highlight the need to strengthen instructional approaches that provide greater opportunities for higher-order thinking activities. Teachers should design learning situations that encourage students to explain their reasoning, compare solution strategies, re-examine answers, and draw conclusions independently. Such approaches are expected to support the development of students' mathematical critical thinking skills more comprehensively.

Interpretation Indicator

The average score for the interpretation indicator was 41.75, categorized as moderate. This result indicates that students' ability to understand and interpret mathematical information presented in problems still needs improvement. Some

EMTEKA: Jurnal Pendidikan Matematika e-ISSN 2746-5594
Volume 7, No. 1, 2025. 164-178 p-ISSN 2746-5608
DOI: https://doi.org/10.24127/emteka.v6i1.10662

students were not fully able to identify and organize essential information before initiating the problem-solving process. In mathematical problem solving, the ability to understand the problem is the initial stage that determines the success of constructing appropriate solution strategies. This can be observed in students' responses presented in Figure 3.



Soal

No	Soal :
1	Di pondok Pesantren Islam Al-Irsyad, dapur pesantren menyiapkan 1 karung beras berisi 20 kg untuk makan para santri selama satu hari. Saat sarapan pagi, digunakan $\frac{1}{4}$ karung beras. Untuk makan siang, digunakan $\frac{2}{5}$ karung beras, sedangkan sisa nya digunakan untuk makan malam.
a	Berapa bagian karung beras yang tersisa untuk makan malam? **Langkah penyelesaian:** $\frac{1}{4} + \frac{2}{5} = \frac{5+8}{20} = \frac{13}{20} \rightarrow \frac{20}{1} - \frac{13}{20} = \frac{400-13}{20} = \frac{387}{20}$
b	Jelaskan makna perhitunganmu dalam konteks kegiatan makan para santri di pondok! **Langkah penyelesaian:** Pagi : $\frac{1}{4}$ Malam : Siang : $\frac{2}{5}$

Figure 3. Example of students' errors in interpreting problems

Based on students' responses in Figure 3, it can be observed that students directly performed calculations without first identifying the known and required information in the problem. This indicates that students' thinking processes tend to focus more on computational procedures rather than on understanding the structure of the problem. This tendency may arise because students are frequently exposed to exercises emphasizing algorithmic steps, leading them to search for answers through calculation without systematically identifying the relevant information.

From the perspective of critical thinking theory, interpretation plays a crucial role in understanding the meaning of information, clarifying problems, and identifying relationships among available data. In the critical thinking framework proposed by Facione, interpretation serves as the foundation for the processes of analysis, evaluation, and inference in problem solving. Problem-solving is a fundamental competency in mathematics education that demands a solid understanding of concepts as well as the use of effective learning strategies (Ningrum et al., 2025). Therefore, when interpretation skills are not well developed, subsequent thinking processes may also encounter difficulties.

In addition, the suboptimal performance on the interpretation indicator may also be related to students' mathematical literacy skills in understanding context-based or story-based problems. Problems presented in narrative form require students to connect verbal information with relevant mathematical concepts. If these skills have not developed sufficiently, students tend to have difficulty identifying key information and the relationships between pieces of information needed to solve problems.

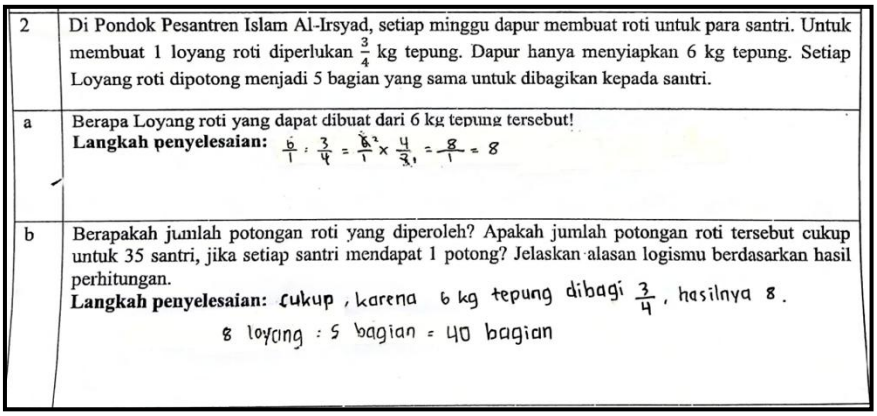
This finding aligns with research conducted by Rahmawati et al. (2023), which suggests that junior high school students tend to struggle with understanding the context of a problem before determining the appropriate solution strategy. Limited experience in solving non-routine problems and low

e-ISSN 2746-5594
p-ISSN 2746-5608

mathematical literacy skills are factors influencing achievement in this interpretation aspect.

Analysis Indicator

The analysis indicator obtained an average score of 42.50, which falls within the moderate category. This result indicates that some students have developed basic abilities to relate the information presented in the problem to relevant mathematical concepts, although this ability has not yet developed optimally. In the context of mathematical critical thinking, analytical ability involves identifying relationships among pieces of information, interpreting the structure of the problem, and determining appropriate solution strategies. This condition can be observed in students' responses shown in Figure 4.


2 Di Pondok Pesantren Islam Al-Irsyad, setiap minggu dapur membuat roti untuk para santri. Untuk membuat 1 loyang roti diperlukan $\frac{3}{4}$ kg tepung. Dapur hanya menyiapkan 6 kg tepung. Setiap Loyang roti dipotong menjadi 5 bagian yang sama untuk dibagikan kepada santri.

a Berapa Loyang roti yang dapat dibuat dari 6 kg tepung tersebut!
Langkah penyelesaian: $\frac{6}{1} : \frac{3}{4} = \frac{6}{1} \times \frac{4}{3} = \frac{8}{1} = 8$

b Berapakah jumlah potongan roti yang diperoleh? Apakah jumlah potongan roti tersebut cukup untuk 35 santri, jika setiap santri mendapat 1 potong? Jelaskan alasan logismu berdasarkan hasil perhitungan.
Langkah penyelesaian: cukup, karena 6 kg tepung dibagi $\frac{3}{4}$, hasilnya 8.
8 loyang : 5 bagian = 40 bagian

Figure 4. Example of students' errors in problem analysis

As illustrated in Figure 4, students were generally able to perform calculation procedures but did not clearly explain the relationship between the information given in the problem and the solution steps they applied. Many students did not explicitly state the known information, the required information, or the reasoning underlying their calculations. This suggests that students tended to focus on procedural steps rather than analyzing the conceptual structure of the problem.

This tendency indicates that students' thinking processes remain largely procedural, meaning that they rely on previously learned algorithms without conducting deeper analysis of the relationships among the available information. Such conditions are common in mathematics learning environments where students are frequently exposed to routine problems with similar solution patterns. Consequently, students often apply formulas directly without examining the conceptual relationships embedded in the problem.

From the perspective of Facione's critical thinking framework, analysis involves identifying argument structures, recognizing relationships among statements, and evaluating the relevance of information in a problem situation. When this ability is not fully developed, students tend to experience difficulties in articulating the mathematical reasoning underlying their solution processes.

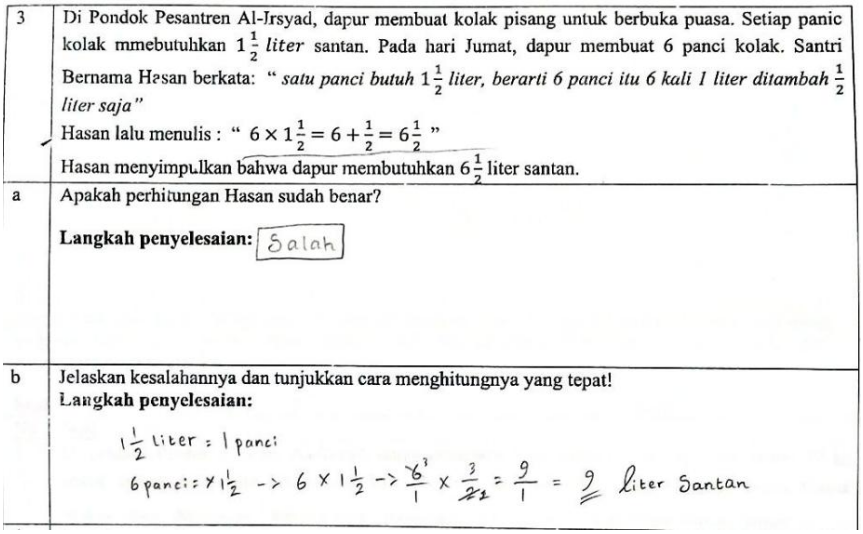
This finding is consistent with the study conducted by Sukmawati (2024) which reported that students with moderate levels of critical thinking are generally able to solve problems requiring analytical skills but still encounter

e-ISSN 2746-5594
p-ISSN 2746-5608

difficulties when explaining conceptual relationships in greater depth. This suggests that students' analytical abilities need to be further developed through learning approaches that emphasize reasoning processes and conceptual explanations rather than merely procedural problem-solving.

Evaluation Indicator

The evaluation indicator obtained an average score of 55.25, which falls within the moderate category and represents a relatively higher achievement compared to the interpretation and analysis indicators. This finding indicates that some students have begun to develop the ability to assess the correctness of solution procedures and review the results they obtained. However, this ability is not always accompanied by clear logical explanations regarding why a particular step or result is considered correct or incorrect. An illustration of students' responses can be seen in Figure 5.


3 Di Pondok Pesantren Al-Irsyad, dapur membuat kolak pisang untuk berbuka puasa. Setiap panic kolak mmebutuhkan $1\frac{1}{2}$ *liter* santan. Pada hari Jumat, dapur membuat 6 panci kolak. Santri Bernama Hasan berkata: " *satu panci butuh* $1\frac{1}{2}$ *liter, berarti 6 panci itu 6 kali 1 liter ditambah* $\frac{1}{2}$ *liter saja*"
Hasan lalu menulis : " $6 \times 1\frac{1}{2} = 6 + \frac{1}{2} = 6\frac{1}{2}$ "
Hasan menyimpulkan bahwa dapur membutuhkan $6\frac{1}{2}$ liter santan.

a Apakah perhitungan Hasan sudah benar?
Langkah penyelesaian: Salah

b Jelaskan kesalahannya dan tunjukkan cara menghitungnya yang tepat!
Langkah penyelesaian:
$1\frac{1}{2}$ liter : 1 panci
6 panci : $\times 1\frac{1}{2}$ -> $6 \times 1\frac{1}{2}$ -> $\frac{6^3}{1} \times \frac{3}{2_1} = \frac{9}{1} = 9$ liter Santan

Figure 5. Example of students' errors in evaluating the problem

Based on the students' responses shown in Figure 5, it can be observed that students were able to recognize that the calculation in the given example was incorrect and attempted to revise the solution process. However, their explanations were generally limited to recalculating the problem without explicitly identifying the source of the error in the previous solution steps. This indicates that although students were able to review their answers, they had not fully developed the ability to articulate the mathematical reasoning underlying their evaluation.

From the perspective of critical thinking theory, evaluation does not merely involve determining whether an answer is correct or incorrect. Rather, it also involves assessing the validity of procedures, examining the reasoning underlying each step, and evaluating the consistency of the results with the context of the problem. According to Facione's critical thinking framework, evaluation requires individuals to assess the credibility of statements and the strength of arguments used within a reasoning process. Consequently, when students are unable to clearly explain the reasoning behind their judgments, their evaluative ability can be considered to be at an early stage of development.

EMTEKA: Jurnal Pendidikan Matematika e-ISSN 2746-5594
Volume 7, No. 1, 2025. 164-178 p-ISSN 2746-5608
DOI: https://doi.org/10.24127/emteka.v6i1.10662

The relatively higher achievement in the evaluation indicator may also be influenced by students' habitual practice of checking their answers after completing calculations. In mathematics learning, verifying the accuracy of results is a common practice used to ensure correct computation. While this habit can help students develop the ability to reassess their solutions, the evaluation process often remains focused on verifying the final answer rather than examining the reasoning or strategy used to obtain it.

These findings are consistent with the study conducted by Rani & Napitupulu (2015), which reported that evaluative ability in mathematical critical thinking generally falls within the moderate category. Students are often able to determine whether an answer is correct but are not yet accustomed to providing systematic explanations that justify their decisions. Therefore, mathematics instruction should provide more opportunities for students to articulate their reasoning, compare different solution strategies, and discuss errors that arise during the problem-solving process. Such learning practices may support the development of students' evaluative abilities in mathematical critical thinking.

Inference Indicator

The inference indicator obtained an average score of 57.50, which also falls within the moderate category and represents the highest achievement among the four indicators examined in this study. This result suggests that some students were able to draw conclusions from the solution processes they carried out. This ability reflects students' emerging capacity to use calculation results to determine final decisions or statements related to the given problem. An example of students' responses can be observed in Figure 6.

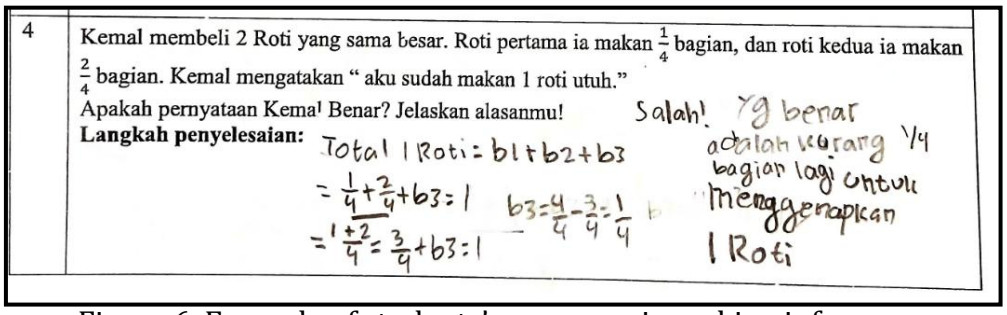

4 Kemal membeli 2 Roti yang sama besar. Roti pertama ia makan $\frac{1}{4}$ bagian, dan roti kedua ia makan $\frac{2}{4}$ bagian. Kemal mengatakan " aku sudah makan 1 roti utuh."
Apakah pernyataan Kemal Benar? Jelaskan alasanmu!
Langkah penyelesaian: Salah! yg benar adalah kurang 1/4 bagian lagi untuk menggenapkan 1 Roti
Total 1 Roti = b1 + b2 + b3
$= \frac{1}{4} + \frac{2}{4} + b3 = 1$ $b3 = \frac{4}{4} - \frac{3}{4} = \frac{1}{4}$
$= \frac{1+2}{4} = \frac{3}{4} + b3 = 1$

Figure 6. Example of students' responses in making inferences

Based on the students' responses presented in Figure 6, it can be seen that students were able to determine the results of fraction calculations related to the portion of bread consumed and subsequently use these results to evaluate the correctness of the statement presented in the problem. This indicates that students engaged in reasoning processes by connecting calculation results with the conclusions they formulated. Nevertheless, the conclusions provided were generally simple and were not accompanied by comprehensive mathematical explanations regarding why the statement was considered correct or incorrect.

From the perspective of critical thinking, inference refers to the ability to draw logical conclusions based on available information and prior reasoning processes. In Facione's framework, inference involves identifying relationships

e-ISSN 2746-5594
p-ISSN 2746-5608

among pieces of information, considering available evidence, and formulating conclusions that can be logically justified. Therefore, when students are able to determine a final result but are unable to clearly explain the reasoning behind their conclusions, the inference process can be considered to be at a basic level.

The relatively higher achievement in the inference indicator compared to other indicators may be related to students' common practice in mathematics learning, which often emphasizes determining the final answer of a calculation. In many problem-solving activities, students are primarily required to produce the final result, leading them to become accustomed to drawing conclusions based on calculation outcomes. However, this practice does not always develop their ability to explain the reasoning process systematically.

Furthermore, instructional practices that emphasize routine problem-solving may also influence students' ability to express mathematical arguments. When students are more frequently trained to perform calculations rather than explain their thinking processes, their ability to construct conclusions supported by mathematical reasoning becomes less developed. As a result, students' inference processes may remain intuitive rather than grounded in structured mathematical reasoning.

These findings are consistent with the study conducted by Wibowo & Murtiyasa (2025), which reported that students are often able to determine conclusions but are not accustomed to explicitly presenting mathematical justifications. Therefore, mathematics learning should provide broader opportunities for students to express their reasoning, explain their thinking processes, and construct mathematical arguments that support the conclusions they draw. Instructional strategies emphasizing discussion, contextual problem-solving, and exploration of multiple solution strategies may help develop students' inference abilities more effectively.

Conclusion and Suggestion

The Based on the analysis of the four indicators of mathematical critical thinking skills, it can be concluded that the mathematical critical thinking skills of seventh-grade students at MTs Al-Irsyad Riau in the topic of fractions are generally at a moderate level. The interpretation and analysis indicators show relatively lower achievement compared to the evaluation and inference indicators. This indicates that many students still experience difficulties during the early stages of problem solving, particularly in understanding the problem, identifying relevant information, and connecting the information with appropriate mathematical concepts.

In contrast, the relatively higher achievement in evaluation and inference suggests that students are somewhat more capable of reviewing calculation results and drawing conclusions from their solution processes. These findings imply that mathematics instruction should place greater emphasis on developing students' abilities to understand problem contexts, analyze relationships among information, and construct logical mathematical arguments so that their mathematical critical thinking skills can develop more optimally.

This study has several limitations that should be considered when interpreting the results. First, the study involved only one class of students at MTs

e-ISSN 2746-5594
p-ISSN 2746-5608

Al-Irsyad Riau; therefore, the findings cannot yet be generalized to a broader population. Second, students' mathematical critical thinking skills were measured using written tests, which may not fully capture students' cognitive processes in depth when solving mathematical problems. In addition, the study focused solely on fraction topics, meaning that the findings may not represent students' mathematical critical thinking abilities across other mathematical topics.

Future research is therefore recommended to involve larger samples, employ more diverse data collection techniques, and examine mathematical critical thinking skills across a wider range of mathematical topics in order to obtain a more comprehensive understanding of students' critical thinking development.

Reference

Agus, I., & Purnama, A. N. (2022). Kemampuan Berpikir Kritis Matematika Siswa: Studi pada Siswa SMPN Satu Atap. *Jurnal Pendidikan Matematika Raflesia*, *07*(01), 65–74. https://doi.org/10.33369/jpmr.v7i1.20143

Amanda, N., Nusantara, T., Studi, P., Matematika, P., Matematika, F., & Alam, P. (2020). Analisis Berpikir Kritis Siswa terhadap Pemecahan Masalah Matematika di MTs Surya Buana Malang Analysis Critical Thinking of Students at Mathematical Problem Solving in MTs Surya Buana Malang. *Jurnal Pendidikan Matematika Dan Sains*, *8*(2), 89–92. https://doi.org/10.21831/jpms.v8i2.19660

Anggraini, N. P., Siagian, T. A., & Agustinsa, R. (2022). Analisis Kemampuan Berpikir Kritis Matematis Siswa Dalam Menyelesaikan Soal Berbasis AKM. *ALGORITMA: Journal of Mathematics Education*, *4*(1), 58–78. https://doi.org/10.15408/ajme.v4i1.25325

Anugraheni, I., & Sartono, E. K. E. (2022). Analisis Kemampuan Berpikir Kritis Matematis Berbasis Realistik. *Scholaria: Jurnal Pendidikan Dan Kebudayaan*, *12*(3), 244–249. https://doi.org/10.24246/j.js.2022.v12.i3.p244-249

Burhanuddin, Zainudin, & Dewi, H. R. D. (2025). Penerapan Model Problem Based learning pada Pembelajaran Matematika untuk melatih Keterampilan Berpikir kritis Siswa SMP. *SIGMA: Jurnal Pendidikan Matematika*, *17(2)*, 418–425. https://doi.org/10.26618/sigma.v17i2.18137

Defiyanti, & Sumarni, W. (2019). Analisis Kemampuan Berpikir Kritis Peserta Didik pada Penerapan Problem Based Learning Berbantuan Lembar Kerja Peserta Didik Bermuatan Etnosains. *Jurnal Phenomenon*, *09*(2), 206–218. https://doi.org/10.21580/phen.2019.9.2.4200

Dewi, N. K., Untu, Z., & Dimpudus, A. (2020). Analisis kesulitan menyelesaikan soal matematika materi operasi hitung bilangan pecahan siswa kelas VII. *Jurnal PRIMATIKA*, *9(2)*, 61–70. https://doi.org/10.30872/primatika.v9i2.217

Elmawati, E., & Juandi, D. (2022). Mathematical Critical Thinking Ability In Indonesia: Systematic Literature Review (SLR). *Symmetry: Pasundan Journal of Research in Mathematics Learning and Education*, *7*(2), 210–221. https://doi.org/10.23969/symmetry.v7i2.6426

Faiziyah, N., & Priyambodho, B. L. (2022). Analisis Kemampuan Berpikir Kritis Dalam Menyelesaikan Soal Hots Ditinjau Dari Metakognisi Siswa. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(4), 2823-2825. https://doi.org/10.24127/ajpm.v11i4.5918

Fitri, W. J., Maimunah, & Suanto, E. (2023). Analisis Kemampuan Berpikir Kritis Matematis Siswa Smp Pada Materi Persamaan Garis Lurus. *Jurnal Pendidikan Tambusai*, *6*(2), 1678–1688. https://journal.unnes.ac.id/sju/prisma/article/view/66798

Gampu, G., & Ambarita, M. R. (2025). Analisis Kesulitan Belajar Siswa Sekolah Dasar pada Materi Pecahan. *Pedagogik Journal of Islamic Elementary School*, *8*(1), 398–406. https://doi.org/10.24256/pijies.v8i1.7387

Hariyani, M., Herman, T., Suryadi, D., & Prabawanto, S. (2022). Mengembangkan Desain Didaktis Berdasarkan Hambatan Belajar dan Learning Trajectory Siswa pada Konsep Dasar Pecahan di Sekolah Dasar. *DWIJA CENDEKIA: Jurnal Riset Pedagogik*, *6*(2), 416-425. https://doi.org/10.20961/jdc.v6i2.63429

Hikmah, N., & Kartika. (2022). Analisis Kemampuan Berpikir Kritis Matematis Siswa pada Materi Pecahan. *SEPREN : Journal of Mathematics Education and Applied*, *4*(1), 88–94. https://doi.org/10.36655/sepren.v4i1

Katherina Estherika, A., & Setianingsih, R. (2022). Analisis Kemampuan Numerasi Siswa SMA dalam Menyelesaikan Soal Asesmen Kompetensi Minimum (AKM). *Jurnal Ilmiah Pendidikan Matematika*, *11*(3), 837–849. https://doi.org/10.26740/mathedunesa.v11n3.p837-849

Kusniawati, I., Vahlia, I., & ES, Y. R. (2020). Peningkatan self-regulated dan berpikir kritis matematika melalui model pembelajaran treffinger. *EMTEKA: Jurnal Pendidikan Matematika*, *1*(1), 62-71. https://doi.org/10.24127/emteka.v1i1.411

Landu, N. (2024). Deskripsi Kesulitan Belajar Matematika Siswa dalam Merencanakan dan Menerapkan Prinsip Matematika Pada Materi Pecahan. *Linear : Jurnal Ilmu Pendidikan*, *8*(2), 102–114. https://doi.org/10.53090/j.linear.v8i2.775

Lusiana, T. V., Slamet, S. Y., & Surya, A. (2022). Analisis Kemampuan Berpikir Kritis Pembagian Pecahan pada Mata Pelajaran Matematika Peserta Didik Kelas V Sekolah Dasar. *Didaktika Dwija Indria*, *10*(4), 24–29. https://doi.org/10.20961/ddi.v10i4.63245

Meirina, E. N., Riswari, L. A., & Kironoratri, L. (2024). Analisis Kesalahan Siswa Kelas Vi Sd 3 Jekulo Dalam Menyelesaikan Soal Cerita Materi Pecahan. *JP2M (Jurnal Pendidikan Dan Pembelajaran Matematika)*, *10*(1), 85–95. https://doi.org/10.29100/jp2m.v10i1.5382

Munawwarah, M., Laili, N., & Tohir, M. (2020). Keterampilan Berpikir Kritis Mahasiswa Dalam Memecahkan Masalah Matematika Berdasarkan Keterampilan Abad 21. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, *2*(1), 37–58. https://doi.org/10.35316/alifmatika.2020.v2i1.37-58

Mursidah, Rosjanuardi, R., & Juandi, D. (2023). Kemampuan Berpikir Kritis Dalam Pemecahan Masalah Matematika; Systematic Literatur Review. *JPMI: Jurnal Pembelajaran Matematika Inovatif*, *6*(4), 1421–1431. https://doi.org/10.22460/jpmi.v6i4.17933

Ningrum, A. P. S., Andayani, S., Vahlia, I., & Dewi, W. U. (2025). Analysis Of Problem Solving In Spldv Material Using Castel Stages Reviewed From Students'Learning Styles. *EMTEKA: Jurnal Pendidikan Matematika*, *6*(2), 1006-1018. https://doi.org/10.24127/emteka.v6i2.8803

Nurhasanah, A., Bistari, B., & Halidjah, S. (2024). Profil Kemampuan Berpikir Kritis Peserta Didik pada Materi Pecahan Kelas IV Sekolah Dasar Islam Al Azhar 21 Pontianak. *Islamika*, *6*(4), 1919–1932. https://doi.org/10.36088/islamika.v6i4.5400

Nurussama, A., & Hermanto, H. (2022). Analysis of Students' Misconceptions on Fractional Materials Reviewed from the Theory of Constructivism. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *11*(1), 641-653. http://dx.doi.org/10.24127/ajpm.v11i1.4697

Oktaviana, O., & Jazim & Vahlia, I. (2017). Pengaruh Model Pembelajaran Creative Problem Solving Berbantu Media Ular Tangga Bangun Ruang Terhadap Kreativitas Belajar Siswa Kelas VIII MTs Ma'Arif Nu 5 Sekampung. *Semnasdik FKIP*, *1*(1), 293-301. https://repository.ummetro.ac.id/files/artikel/56fdd9c88217aa4847b50502a3f40862.pdf

Prajono, R., Gunarti, D. Y., & Anggo, M. (2022). Analisis Kemampuan Berpikir Kritis Matematis Peserta Didik SMP Ditinjau dari Self Efficacy. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(1), 143–154. https://doi.org/10.31980/mosharafa.v11i1.694

Rahmawati, H., Pujiastuti, P., & Cahyaningtyas, A. P. (2023). Kategori Kemampuan Berpikir Kritis Siswa Kelas Empat Sekolah Dasar di SD se Gugus II Kapanewon Playen, Gunung Kidul. *Jurnal Pendidikan Dan Kebudayaan*, *8(1)*, 88–104. https://doi.org/10.24832/jpnk.v8i1.3338

Rani, F. N., & Napitupulu, E. (2015). Analisis Kemampuan Berpikir Kritis Matematis Siswa Melalui Pendekatan Realistic Mathematics Education Di SMP Negeri 3 Stabat. *PJRM (Paradikma Jurnal Pendidikan Matematika*, 11(1), 1–7. https://doi.org/10.24114/paradikma.v11i1.22886

Safitri, N., Hodsay, Z., & Ningsih, Y. L. (2025). kemampuan Pemahaman Konsep Matematika Siswa pada Materi pecahan Kelas III SD N 06 Palembang. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *10*(3), 309–318. https://doi.org/10.23969/jp.v10i03.28783

Sahda, T. S., Suastika, I. K., & Rahayu, S. (2025). *Analisis Kemampuan Berpikir Kritis pada Penyelesaian Soal Cerita Pecahan Kelas V SDN 1 Wonorejo*. *5*(1), 596-606. https://doi.org/10.33379/ebtida.v5i1.7490

Sukmawati, R. (2024). Analisis Kemampuan Berpikir Kritis Siswa Sekolah Menengah Pertama (Smp) dalam Pembelajaran Matematika. *Jurnal Matematic Paedagogic*, *8*(2), 117–124. https://orcid.org/0009-0005-9305-8336

Sutarsa, D. A., & Puspitasari, N. (2021). Perbandingan Kemampuan Berpikir Kritis Matematis Siswa antara Model Pembelajaran GI dan PBL. *Plusminus: Jurnal Pendidikan Matematika*, *1*(1), 169–182. https://doi.org/10.31980/plusminus.v1i1.1035

Suryani, T., & Haryadi, R. (2020). Analisis Kemampuan Berpikir Kritis Pada Materi Statistika Siswa Kelas VIII MTS Assalam Pontianak. *Jurnal Prodi Pendidikan Matematika (JPMM)*, *4*(1), 348. https://jurnal.mipatek.upgripnk.ac.id/index.php/JPPM/article/view/386

Syarifuddin, S. (2019). Identifikasi Kesulitan Representasi Matematis Siswa SMP pada Pemecahan Masalah Pecahan. *SUPERMAT: Jurnal Pendidikan Matematika*, *3*(1), 34–42. https://doi.org/10.33627/sm.v3i1.174

e-ISSN 2746-5594
p-ISSN 2746-5608

Umbara, H. D. A. D., Jupri, A., & Dahlan, J. A. (2025). Mathematical Critical Thinking Ability of Grade IX Students in Solving Ill-Structured Problems. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *15*(1), 185–194. https://journal.lppmunindra.ac.id/index.php/Formatif/article/view/27337

Vahlia, I., Rahmawati, D., Mustika, M., Yunarti, T., & Nurhanurawati, N. (2021). Pengembangan E-Modul Aljabar Linear Berbasis Socrates Berbantu Aplikasi Android untuk Meningkatkan Keterampilan Berpikir Kritis dan Hasil Belajar Mahasiswa. M Metro. https://eprints.ummetro.ac.id/2108/

Wibowo, S. A., & Murtiyasa, B. (2025). Analisis Kemampuan Berpikir Kritis Matematis dengan Pendekatan Problem Based Learning pada Pembelajaran Matematika. *Math Didactic: Jurnal Pendidikan Matematika*, *11*(2), 208–219. https://doi.org/10.33654/math.v11i2.191