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Students' Critical Thinking Dispositions: Truth Seeking and Systematic

Syamsulrizal*[1], Supratman[2], Sahidi[3]
[1]Mathematics Education, Universitas Pendidikan Muhammadiyah Sorong, Indonesia
[2]Mathematics Education, Universitas Sembilanbelas November Kolaka, Indonesia

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***Abstract*:**
This study aims to describe students' critical thinking dispositions in the aspects of truth-seeking and systematic thinking in mathematical problem-solving. This research employed a qualitative descriptive design involving two ninth-grade students selected through purposive sampling based on high mathematical ability. Data were collected through problem-solving tasks and semi-structured interviews and analyzed using indicators of truth-seeking (identifying relevant information, evaluating assumptions, and using accurate data) and systematic thinking (organizing solution steps logically, using appropriate mathematical notation, and verifying results). Data validity was ensured through triangulation of written responses and interview data. The findings reveal that students are generally able to organize relevant data, follow logical procedures, and obtain correct answers, indicating the presence of procedural-level critical thinking dispositions. However, students demonstrate weaknesses in verifying assumptions and evaluating final results, showing that reflective aspects of critical thinking are not yet fully developed. These findings highlight a gap between procedural competence and the depth of critical thinking dispositions, where correct answers do not necessarily reflect strong critical thinking. This study contributes theoretically by emphasizing that critical thinking involves not only cognitive skills but also reflective habits that require explicit development. Practically, the results suggest the need for instructional strategies that encourage students to recheck their work, question assumptions, and reflect on their reasoning processes.

Keywords: Critical-Thinking; Dispositions; Truth Seeking; Systematic; Mathematical-ability.

Introduction

Critical thinking is an essential skill needed to face the complex challenges of the twenty-first century (Yoke et al., 2020). In an era characterized by rapid technological advancement and the widespread availability of information, individuals are required to evaluate information critically, solve complex problems, and make informed decisions. Critical thinking enables individuals to filter information, adapt to change, collaborate effectively, and develop independence and responsibility in various social contexts (Kong & Song, 2013). These competencies are particularly important in education because they support students in understanding problems, evaluating evidence, and making logical conclusions.

International educational assessments also highlight the importance of critical thinking in learning. The Programme for International Student Assessment (PISA) emphasizes that students need critical thinking skills to objectively evaluate

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information and solve complex problems in real-life contexts (Wu, 2010). Similarly, the Trends in International Mathematics and Science Study (TIMSS) indicates that students must not only master curriculum content but also be able to analyze, interpret, and apply mathematical concepts in various problem situations (Yanto, 2023). These assessments suggest that the development of critical thinking is an important objective of mathematics education because it enables students to deal with complex and unfamiliar problems.

Critical thinking is generally defined as the process of analyzing and evaluating information objectively to make reasoned judgments or decisions (Facione, 2020). This process involves questioning assumptions, evaluating evidence, recognizing biases, and considering alternative perspectives before drawing conclusions (Zhai & Zhang, 2023). In educational contexts, critical thinking is considered a fundamental competence that supports students in developing deeper understanding and meaningful learning experiences.

According to Facione and Gittens (2016), critical thinking consists of two major components: critical thinking skills and critical thinking dispositions. "Critical thinking skills" refer to cognitive abilities such as analysis, evaluation, interpretation, logical reasoning, and problem-solving. These skills enable individuals to process information and construct logical arguments. In contrast, critical thinking disposition refers to an individual's inclination or willingness to apply these cognitive skills when encountering problems. Dispositions involve affective tendencies that influence whether individuals actively engage in critical thinking processes.

While many studies in mathematics education emphasize the development of critical thinking skills, dispositions play an equally important role because they determine whether individuals are willing to apply those skills consistently in problem-solving situations (Paul & Elder, 2019; Facione & Gittens, 2016). Students may possess adequate cognitive skills but may not use them effectively if they lack the disposition to question information, verify assumptions, or examine solutions carefully. Therefore, examining students' critical thinking dispositions is important for understanding how students approach mathematical problems beyond simply evaluating the correctness of their answers.

Several studies have explored the relationship between critical thinking dispositions and learning outcomes. Liu et al. (2023) found that students with stronger critical thinking dispositions tend to demonstrate better academic performance because they are more capable of analyzing problems and evaluating information critically. Similarly, Khoshgoftar and Barkhordari-Sharifabad (2023) reported that medical students who showed positive critical thinking dispositions, particularly in the dimension of inquisitiveness, demonstrated stronger reflective capacity. However, the truth-seeking dimension appeared less prominent among the participants. Although this study was conducted in the context of mathematic education, the findings suggest that different dimensions of critical thinking disposition may develop

differently depending on the learning environment (Asyika et al., 2026). This indicates the importance of examining specific dimensions of critical thinking dispositions within different disciplinary contexts, including mathematics education (Silwana & Widayanti, 2024).

Despite the increasing number of studies on critical thinking, most previous research has focused primarily on measuring students' critical thinking skills rather than examining their critical thinking dispositions in depth (Toh et al., 2026; Sebido & Muegna, 2026). In mathematics education, studies often emphasize students' ability to obtain correct solutions, while less attention is given to the dispositions that influence how students approach the problem-solving process, such as their tendency to seek accurate information or organize solutions systematically (Keles & Yazgan, 2025). Furthermore, empirical studies examining the dimensions of truth-seeking and systematicity in mathematical problem solving remain limited, particularly in the context of Indonesian junior high schools.

In the Indonesian mathematics education context, developing students' critical thinking is one of the important objectives of the national curriculum (Antika et al., 2025). However, many students still experience difficulties in analyzing problems, verifying assumptions, and evaluating the accuracy of their solutions. Findings from international assessments such as PISA and TIMSS also indicate that Indonesian students often face challenges in solving problems that require higher-order thinking and critical reasoning (Musa et al., 2025). Therefore, examining students' critical thinking dispositions, particularly the aspects of truth-seeking and systematicity, is important to understand how students approach mathematical problem solving and how these dispositions appear during the problem-solving process.

Based on these considerations, this study aims to describe students' critical thinking dispositions in the aspects of truth-seeking and systematicity in mathematical problem-solving. The research question guiding this study is: How are students' critical thinking dispositions reflected in the aspects of truth-seeking and systematicity during mathematical problem-solving?

Literature Review

Critical thinking is essential in modern education, particularly in disciplines that demand high levels of analytical reasoning and decision-making. Critical thinking disposition refers to an individual's tendency or inclination to apply critical thinking skills in various situations. Among its core aspects, truth-seeking refers to a deep desire to discover the truth, even when it contradicts commonly accepted opinions, while systematicity involves a structured and organized approach to analyzing problems (Rahman et al., 2023; Facione, 2020). These two dimensions play an important role in influencing how individuals approach problem solving and evaluate information in different learning contexts.

In mathematics education, the development of critical thinking dispositions is particularly important because solving mathematical problems requires students not only to obtain correct answers but also to evaluate information, examine assumptions, and verify the accuracy of their reasoning. As'ari et al. (2019) showed that learning environments that encourage truth-seeking behaviors can improve students' motivation and engagement in mathematical problem solving. Similarly, recent studies in mathematics education suggest that instructional approaches emphasizing reasoning, discussion, and reflective thinking can help develop students' systematic and critical approaches to solving mathematical problems (Rahman et al., 2023).

Assessment instruments have also been developed to measure critical thinking dispositions. Tools such as the California Critical Thinking Disposition Inventory (CCTDI) have been widely used to assess dimensions including truth-seeking and systematicity. Studies by Liu et al. (2026) and Manassero-Mas et al. (2022) indicate that such instruments have been adapted and validated across diverse cultural contexts, demonstrating the global relevance of these dimensions in evaluating critical thinking dispositions. However, most studies using these instruments focus on measuring overall disposition levels rather than examining how specific dispositions appear during the process of solving mathematical problems.

The truth-seeking dimension involves a commitment to intellectual honesty, valuing evidence, and investigating multiple perspectives before drawing conclusions (Guo et al., 2026). The CCTDI framework identifies truth-seeking as one of the key dimensions of critical thinking disposition (Chen, 2018). In the context of mathematics learning, truth-seeking can be observed when students carefully analyze the information provided in a problem, question assumptions, and verify the correctness of their solutions. Students who demonstrate strong truth-seeking tendencies tend to re-examine their reasoning, test alternative strategies, and ensure that their answers are logically consistent with the problem conditions (Kurniawati et al., 2026; Ardiansyah et al., 2022). Such behaviors are essential in mathematics because mathematical reasoning requires accuracy, justification, and careful validation of results.

Another important dimension is systematicity, which refers to an individual's tendency to approach problems in a structured and organized manner. Systematic thinkers tend to arrange solution steps logically, apply appropriate procedures, and evaluate results carefully. In mathematical problem solving, systematicity can be reflected in how students organize information, select appropriate strategies, and present their reasoning sequentially. Recent studies in education indicate that systematic approaches to reasoning can enhance students' ability to evaluate arguments, organize solution strategies, and draw well-supported conclusions when solving problems (Rahman et al., 2023; Zhai & Zhang, 2023).

Despite the importance of these dispositions, previous research in mathematics education has largely focused on students' problem-solving performance or critical

thinking skills rather than examining how specific critical thinking dispositions appear during the problem-solving process. In particular, empirical studies exploring how truth-seeking and systematicity are manifested in students' mathematical reasoning remain limited. Therefore, investigating how these dispositions appear when students solve mathematical problems can provide deeper insights into students' reasoning processes and their approaches to evaluating mathematical solutions.

Research Methods

This study employed a qualitative descriptive approach, focusing on ninth-grade students at Karangploso Islamic Junior High School, Malang, Indonesia, as the research subjects. The subjects were selected using purposive sampling, a deliberate sampling technique based on criteria relevant to the research objectives. The requirements for selecting subjects included ninth-grade students who demonstrated the ability to solve mathematical problems using critical thinking skills. Based on these criteria, two students were chosen as the research subjects.

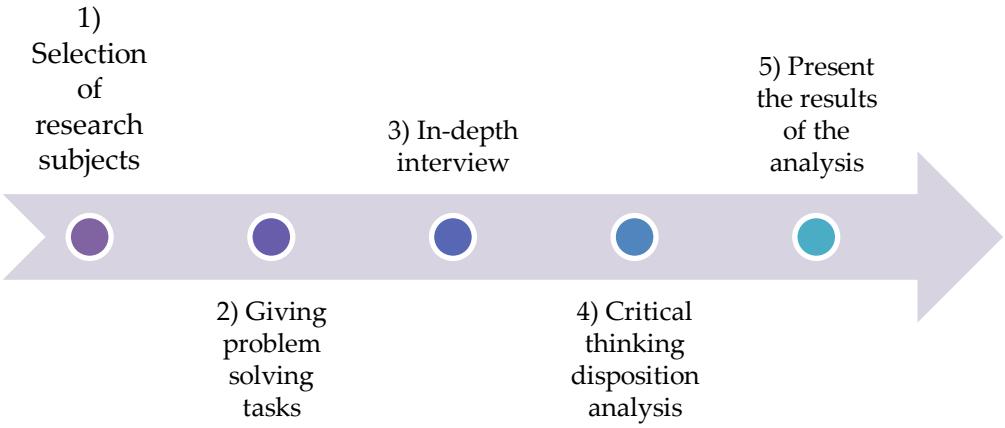


Figure 1. Research Stages

This study consists of five stages carried out sequentially to achieve the research objectives. The stages are as follows: 1) Selection of Research Subjects: The research subjects were selected using purposive sampling. Two students were chosen based on the criterion of high mathematical ability, which is relevant to the focus of this study. The selection was based on the students' potential to exhibit critical thinking in solving mathematical problems. 2) Problem-Solving Task Assignment: The subjects were given two essay-type problems designed to assess their critical thinking skills in solving mathematical problems. These tasks required the students to analyze, plan, and provide logical solutions to the given problems and reveal their critical thinking processes. 3) In-depth Interviews: The researcher conducted in-depth interviews using a semi-structured interview guide to better understand the students' critical thinking processes. These interviews aimed to confirm and further explore the results obtained from the problem-solving tasks. During this stage, data reduction was also done to eliminate irrelevant information, ensuring that the analysis focused solely on data that

supported evaluating the subjects' critical thinking. 4) Analysis of Critical Thinking Disposition Components: Based on data from the problem-solving tasks and interviews, the researcher analyzed two components of critical thinking disposition: Truth-Seeking and Systematicity. This analysis aimed to evaluate whether the subjects demonstrated consistent tendencies or behaviors in objectively seeking the truth and approaching problem-solving in a structured manner. 5) Presentation of Analytical Results: The researcher summarized and presented the analysis results of the subjects' critical thinking dispositions based on the problem-solving tasks and interview data. The outcome of this study is a classification of Truth-Seeking and Systematic behaviors displayed by the subjects in solving mathematical problems. Taks 1: A die is rolled 36 times. What is the probability of obtaining a number less than 3, and what is the expected frequency of this event? Taks 2: At a store, the cost of 4 items of type A and 20 items of type B is Rp 460,000, while the cost of 5 items of type A and 30 items of type B is Rp 675,000. Determine the price of one item of type A and one item of type B. Then, how much must be paid if someone buys 20 items of type A and 1 item of type B?

Below is the table of critical thinking disposition indicators used to assess the Truth-Seeking and Systematic aspects, which served as a guide in evaluating the students' responses.

Tabel 1. Critical thinking disposition indicators

Critical thinking disposition	Critical thinking disposition indicators
Truth-Seeking	1. Search for accurate data or information. 2. Test and re-evaluate data or assumptions. 3. Use appropriate data or information.
Systematic	1. Arrange the steps of the solution that are coherent and logical. 2. Use mathematical notation correctly 3. Check the results or answers obtained.

Results and Discussions

Out of 30 students who took the mathematics ability test, only 7 were classified as having high mathematical ability. Only about 23.33% of the students demonstrated good or above-average mathematical proficiency. These data indicate that the majority of students (76.67%) possess mathematical ability at a moderate or low level.

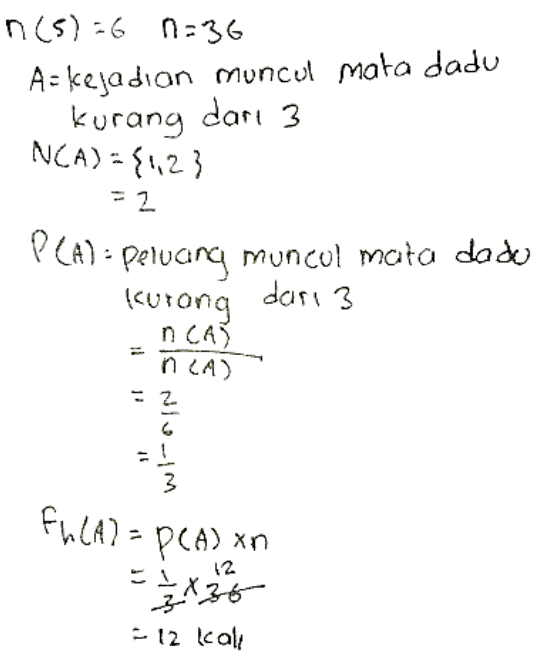
Table 2. Mathematical Ability Test Results

Student Ability	Number	Percentage
High	7	23,33
Medium	18	60
Low	5	16,67

These findings indicate the need for greater attention in mathematics instruction, particularly for students still at moderate and low levels of proficiency. A more in-depth teaching approach—such as additional practice, personalized guidance, or tailored learning strategies—may help improve their understanding of mathematical concepts.

Description of critical thinking disposition of A1 students

Task 1



Translation

$n(s) = 6$; $n = 36$

A= The event of the dice appearing less than 3

N(A)= {1,2}

=2

P(A)= The chance of getting a dice number is less than 3 =n(A)/n(A)

=2/6

=1/3

Fh(A)= P(A)* n

=1/3 * 36

=12 times

Figure 2. Problem-Solving Process for Task 1 – Student A1

Analysis of Critical Thinking Disposition in the Aspect of Truth-Seeking

In the aspect of Truth-Seeking, the student demonstrated the ability to search for accurate data or information. This is supported by the student's statement in the interview: "I read the problem carefully and looked for the given information, such as the number of trials and the sample space." This statement is consistent with the student's work in identifying the sample space $n(S) = 6$, the number of trials $n = 36$, and defining event A as "the appearance of dice faces less than 3," represented as $N(A) = \{1,2\}$. These findings indicate that the student fulfilled the first indicator of truth-seeking, namely the ability to locate and use relevant information as the basis for problem-solving.

However, for the second indicator, namely testing and re-evaluating data or assumptions, the student has not demonstrated this optimally. This can be seen from the error in writing the probability formula, where the student wrote $P(A) = \frac{\mathrm{n(A)}}{\mathrm{n(A)}}$

instead of the correct form $P(A) = \frac{\text{n(S)}}{\text{n(A)}} = \frac{2}{6}$. Although the student stated in the interview that "I made sure that I understood the problem correctly…", this mistake indicates that the student did not thoroughly recheck the data and assumptions used. The absence of correction suggests that the student's self-evaluation process remains weak.

Furthermore, for the third indicator, namely using appropriate data or information, the student generally used the correct data in the calculation, such as the number of favorable outcomes and the total possible outcomes. This is reflected in the correct final result, where $P(A) = \frac{1}{3}$ and the expected frequency is 12 times. However, the notational error indicates that the use of information was not entirely accurate in its mathematical representation. Therefore, it can be concluded that the student has fulfilled the first indicator and partially met the third indicator, but still needs improvement in the second indicator, particularly in testing and re-evaluating data and assumptions to better develop the truth-seeking disposition.

Analysis of Critical Thinking Disposition in the Aspect of Systematic

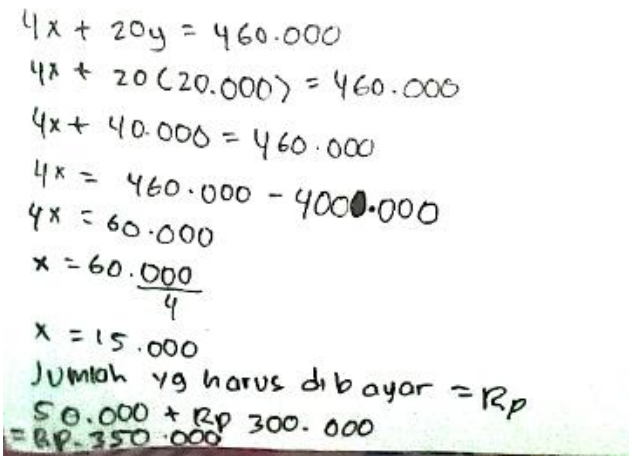
In the Systematic aspect, the student demonstrated the ability to organize the steps of the solution in a coherent and logical sequence. This is supported by the student's statement in the interview: "I first wrote down the known and the asked information, then selected the appropriate formula before starting the calculation." The student followed the correct order of problem-solving, beginning with identifying event A, determining the value of $n(A)$, calculating the probability $P(A)$, and finally determining the expected frequency $F_h(A)$. All steps were arranged in a structured and interconnected manner, indicating that the student was able to think systematically in solving the problem. Therefore, the student has fulfilled the first indicator of the systematic disposition, namely the ability to arrange solution steps in a coherent and logical way.

However, for the second indicator, namely using mathematical notation correctly, the student has not yet demonstrated optimal accuracy. This is evident from the error in writing the probability formula, where the student wrote $P(A) = \frac{n(A)}{n(A)}$, which should have been written as $P(A) = \frac{n(S)}{n(A)}$. This mistake contradicts the student's statement in the interview: "I wrote the numbers and symbols neatly and used fractions or exponents correctly to make them easy to read." Although the overall presentation appears neat, this notational error indicates that the student has not fully understood the importance of precision in using mathematical symbols. This issue is important because incorrect notation can cause confusion and reduce the quality of mathematical communication.

Furthermore, for the third indicator, namely checking the results or answers obtained, the student did not show evidence of a thorough rechecking process. Although the final result of the expected frequency $F_h(A) = 12$ is correct, the student did not correct the notational error. This indicates that the student did not perform a

final verification of the solution. This condition suggests that the student's ability to evaluate and ensure the accuracy of the results still needs improvement. Therefore, although the student has demonstrated the ability to organize solution steps systematically, further development is needed in terms of accuracy in using mathematical notation and the habit of rechecking answers in order to fully develop the systematic critical thinking disposition..

Task 2



Translation

4x+20y=460.000
4x+20(20.000)=460.000
4x+40.000=460.000
4x=460.000-400.000
4x=60.000
x=60.000/4
x=15.000

Amount to be paid = Rp 50.000+Rp 300.000=350.000

Figure 3. Problem Solving Process for Task 2- Student A1

Analysis of Critical Thinking Disposition in the Aspect Truth-Seeking

In the Truth-Seeking aspect, students are expected to seek and verify the accuracy of data and information used in problem-solving. In this context, the student demonstrated the ability to use the initial information provided in the problem and successfully identified the necessary variables, namely the price per gallon of mineral water (x) and the cost per gas cylinder (y) "I *read the problem carefully and noted important information such as the number of mineral water gallons, gas cylinders, and the amount paid by each person*." However, there was a flaw in the initial understanding when the student directly assumed that $y = 20{,}000$ without first calculating or verifying this value. This error indicates a lack of checking and verification of the initial assumption. Therefore, the student has not fully applied the principle of Truth-Seeking, as they failed to re-examine the given data to ensure the accuracy of the information used.

In terms of using the appropriate data or information, the student made an error in the final calculation stage. After correctly finding *x = 15.000*, the student presented the final answer "*The total amount to be paid* $= Rp\,50.000 + Rp\,300.000 = Rp\,350.000$." This answer does not align with the values obtained from the previous calculations, indicating that the student did not consistently apply the calculated prices throughout the solution. The student's skill in accurately using data needs

improvement, particularly in the final stages of calculation, to avoid errors in the final result.

Analysis of Critical Thinking Disposition in the Aspect Systematic

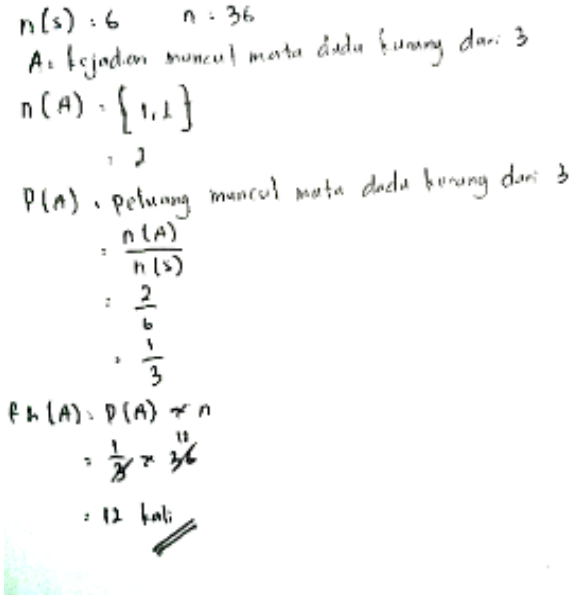
In the Systematic aspect, the student initially showed the ability to arrange a logical and orderly sequence of steps. The student began the process by correctly forming a linear equation, $4x + 20y = 460.000$, to determine the value of x "*I started by writing equations based on the given information. Then, I solved them systematically using substitution to find the unit price of each item*." However, a shortcoming appeared in the next stage when the student substituted $y = 20.000$ without first calculating or confirming this value using the second equation, $5x + 30y = 675.000$. This indicates a lack of carefulness in the final steps, and the sequence of steps was not entirely systematic. The student's ability to organize a solution systematically needs improvement to ensure that each step is followed accurately and logically.

Additionally, regarding the use of proper mathematical notation, the student made minor errors that affected the clarity of the calculation process. While the notation in the initial stage appeared appropriate, during the substitution of the value for y, the student did not provide complete calculations to demonstrate how y = 20.000 was obtained "*I used appropriate symbols and wrote them neatly so they would be easy to understand*." The inaccuracy in notation and the absence of a complete solution reduced the precision and consistency of the solution process. This shows that the student needs to improve their accuracy in using correct mathematical notation to ensure clarity in the final answer.

Finally, regarding verifying the results or final answers, the student did not try to re-check the final answer, which was inconsistent with the values of x and y previously obtained. Although the final answer of $Rp\,350.000$ was reached, the student did not verify whether this result was consistent with the calculations made: "*I substituted the values I found back into the original equation to see if the result matched what was given in the problem*." The failure to check the final answer suggests that the student has not fully applied the principle of verification, which is essential in systematic and critical thinking. The student should be more meticulous and perform a final check to ensure the result is accurate and consistent with the data obtained throughout the problem-solving process.

Description of critical thinking disposition of A2 students

Task 1



Translation

n(s)= 6 n=36

A= The event of the dice appearing less than 3

N(A)= {1,2}

=2

P(A)= The chance of getting a dice number is less than 3

=n(A)/n(S)

=2/6

=1/3

Fh(A) = P(A)* n

=1/3 * 36

=12 times

Figure 4. Problem Solving Process for Student A2 Task 1

Analysis of Critical Thinking Disposition in the Aspect Truth-Seeking

In the indicator of searching for accurate data or information, the student demonstrates a fairly good ability to identify relevant information from the given problem. This is evident from the correct determination of the sample space $n(S) = 6$, which aligns with the concept of rolling a single die, as well as the identification of the event $A = \{1,2\}$ for outcomes less than 3. The student also correctly determines the number of elements in the event, $n(A) = 2$. However, there is a lack of clarity in the notation $n = 36$, as it is not explicitly explained, indicating that the student still needs to improve in presenting information in a complete and systematic manner. This finding is supported by the interview excerpt, where the student stated, "*I know that a die has 6 possible outcomes, so I wrote 6, and the numbers less than 3 are 1 and 2. For 36, it is the number of trials, but I did not write the explanation*."

In the indicator of testing and re-evaluating data or assumptions, the student shows improvement and relatively good performance. The probability formula is written correctly as $P(A) = \frac{\mathrm{n(A)}}{\mathrm{n(S)}}$, indicating that the student understands the appropriate conceptual relationship between the number of favorable outcomes and the total sample space. The consistency between the formula and the subsequent calculation $\frac{2}{6} = \frac{1}{3}$ suggests that the student is able to apply the correct assumption without evident contradiction. However, there is still limited indication that the

student actively re-checks or critically evaluates each step, as the solution is presented in a direct and procedural manner. This is supported by the interview, where the student stated, *"I used the formula I remembered and directly applied it. I think it is already correct, so I did not check it again."*."

In the indicator of using appropriate data or information, the student demonstrates a strong ability to apply relevant information accurately and consistently. The student correctly uses the probability value $P(A) = \frac{1}{3}$ and applies it to calculate the expected frequency using the formula $Fh(A) = P(A) \times n$, resulting in $\frac{1}{3} \times 36 = 12$. This indicates that the student is able to integrate concepts of probability and expected frequency effectively to reach a correct solution. The use of data is precise and logically connected from one step to another. This finding is reinforced by the interview excerpt, where the student stated, "I used one-third and multiplied it by 36 to find how many times it would happen. I am sure the steps and the result are correct."

Overall, the student's critical thinking disposition in the *truth-seeking* aspect can be categorized as fairly developed. The student is able to identify relevant data accurately and use appropriate information to reach the correct solution, as shown in the correct determination of the sample space, event, probability, and expected frequency. In addition, the student demonstrates an understanding of the relationship between concepts and applies them consistently. However, the tendency to rely on procedural work without explicitly re-evaluating or verifying each step indicates that the student's habit of critically examining the correctness of information is not yet fully developed. Therefore, while the student shows good initial efforts in seeking and using accurate data, improvement is still needed in terms of reflection and verification.

Analysis of Critical Thinking Disposition in the Aspect Systematic

In the indicator of arranging solution steps in a coherent and logical manner, the student demonstrates a good ability to organize the problem-solving process systematically. This is evident from the sequence of steps, starting from identifying the sample space $n(S) = 6$, defining the event A, determining the number of elements $n(A) = 2$, calculating the probability $P(A) = \frac{2}{6} = \frac{1}{3}$, and finally determining the expected frequency $Fh(A) = 12$. This sequence indicates that the student understands the logical progression required to solve the problem. However, some parts are presented briefly without clear transitional explanations, meaning the reasoning process is not fully articulated. This is supported by the interview excerpt, where the student stated, "*I started from what is known, then found the probability, and after that I calculated how many times it would occur*."

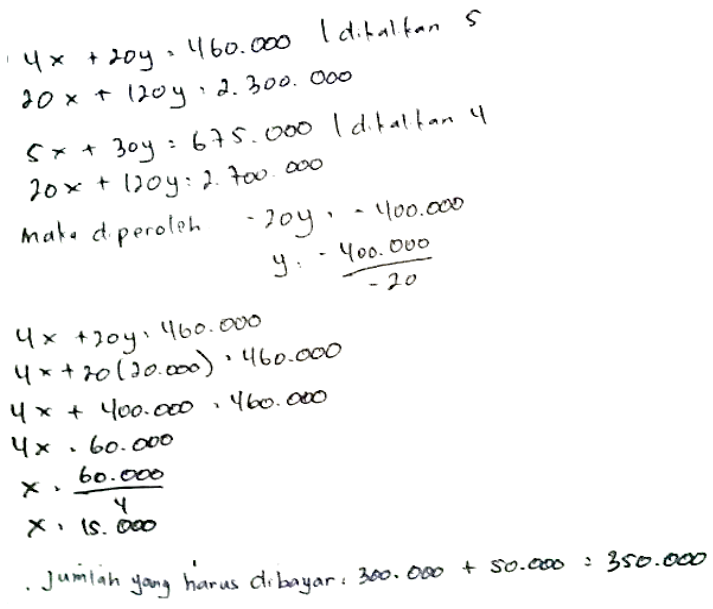
In the indicator of using mathematical notation correctly, the student shows a fairly good ability. The student uses standard mathematical symbols such as $n(S)$, $n(A)$, and $P(A)$ appropriately according to probability concepts. The probability

formula $P(A) = \frac{\text{n(A)}}{\text{n(S)}}$ is written correctly and is consistent with the subsequent calculations. In addition, the notation used in the expected frequency formula $Fh(A) = P(A) \times n$ is also appropriate. However, there are minor inconsistencies in notation, such as the interchangeable use of uppercase and lowercase letters (e.g., $N(A)$ and $n(A)$), and the value $n = 36$ is not fully explained. This is reinforced by the interview, where the student stated, *"I used the symbols as I learned, but sometimes I do not pay much attention to uppercase or lowercase letters, as long as I understand what they mean."*

In the indicator of checking the results or answers obtained, the student still shows weaknesses. Although the final answer is correct, namely an expected frequency of 12, there is no explicit evidence that the student rechecked the steps or verified the result. The solution process appears to move directly toward the final answer without any reflection or validation of correctness. This suggests that the habit of reviewing or evaluating the final result has not been fully developed. This is supported by the interview excerpt, where the student stated, *"I did not check the result again, because I thought that once I got the answer, it was already finished."*

In the *systematic* aspect, the student demonstrates a generally good level of organization in solving the problem. The steps are arranged in a logical and coherent sequence, supported by mostly appropriate use of mathematical notation. This indicates that the student is capable of structuring their thinking in a clear and methodical way. However, the lack of explicit checking or reviewing of the final answer shows that the systematic process is not yet complete. The student tends to focus on reaching the answer rather than ensuring its correctness through verification. Thus, although the student's systematic thinking is fairly strong in terms of procedural structure, it still requires improvement in the final evaluation stage to achieve a more complete and rigorous problem-solving process.

Taks 2



Translation
4x+20y=460.000 multiplied 5
20x+20y=2.300.000
5x+30y=675.000 multiplied 4
20x+120y=2.700.000
So it is obtained -20y=-400.000
y=-400.000/-20
4x+20y=460.000
4x+20(20.000)=460.000
4x+400.000=460.000
4x=60.000
x=60.000/4
x=15.000
Amount to be paid = 300.000+50.000=350.000

Figure 5. Problem-Solving Process for Task 2 – Student A2

Analysis of Students' Critical Thinking Disposition on the Truth-Seeking Indicator

In the Systematic aspect, the student initially showed the ability to arrange a logical and orderly sequence of steps. The student began the process by correctly forming a linear equation, $4x + 20y = 460.000$, to determine the value of x "*I started by writing equations based on the given information. Then, I solved them systematically using substitution to find the unit price of each item*." However, a shortcoming appeared in the next stage when the student substituted $y = 20.000$ without first calculating or confirming this value using the second equation, $5x + 30y = 675.000$. This indicates a lack of carefulness in the final steps, and the sequence of steps was not entirely systematic. The student's ability to organize a solution systematically needs improvement to ensure that each step is followed accurately and logically.

Additionally, regarding proper mathematical notation, the student made minor errors that affected the clarity of the calculation process. While the notation in the initial stage appeared appropriate, during the substitution of the value for y, the student did not provide complete calculations to demonstrate how $y = 20.000$ was obtained "*I used appropriate symbols and wrote them neatly so they would be easy to understand*." The inaccuracy in notation and the absence of a complete solution reduced the precision and consistency of the solution process. This shows that the student needs to improve their accuracy in using correct mathematical notation to ensure clarity in the final answer.

Finally, regarding verifying the results or final answers, the student did not try to re-check the final answer, which was inconsistent with the values of x and y previously obtained. Although the final answer of $Rp\,350.000$ was reached, the student did not verify whether this result was consistent with the calculations made "*I substituted the values I found back into the original equation to see if the result matched what was given in the problem*." The failure to check the final answer suggests that the student has not fully applied the principle of verification, which is essential in systematic and critical thinking. The student should be more meticulous and perform a final check to ensure the result is accurate and consistent with the data obtained throughout the problem-solving process.

Analysis of Students' Critical Thinking Disposition on the Systematic Indicator

In the Systematic aspect, the student initially showed the ability to arrange a logical and orderly sequence of steps. The student began the process by correctly forming a linear equation, $4x + 20y = 460.000$, to determine the value of x "*I started by writing equations based on the given information. Then, I solved them systematically using substitution to find the unit price of each item*." However, a shortcoming appeared in the next stage when the student substituted $y = 20.000$ without first calculating or confirming this value using the second equation, $5x + 30y = 675.000$. This indicates a lack of carefulness in the final steps, and the sequence of steps was not entirely

systematic. The student's ability to organize a solution systematically needs improvement to ensure that each step is followed accurately and logically.

Additionally, regarding proper mathematical notation, the student made minor errors that affected the clarity of the calculation process. While the notation in the initial stage appeared appropriate, during the substitution of the value for y, the student did not provide complete calculations to demonstrate how $y = 20.000$ was obtained "*I used appropriate symbols and wrote them neatly so they would be easy to understand*." The inaccuracy in notation and the absence of a complete solution reduced the precision and consistency of the solution process. This shows that the student needs to improve their accuracy in using correct mathematical notation to ensure clarity in the final answer.

Finally, regarding verifying the results or final answers, the student did not try to re-check the final answer, which was inconsistent with the values of x and y previously obtained. Although the final answer of $Rp\,350.000$ was reached, the student did not verify whether this result was consistent with the calculations made: "*I substituted the values I found back into the original equation to see if the result matched what was given in the problem*." The failure to check the final answer suggests that the student has not fully applied the principle of verification, which is essential in systematic and critical thinking. The student should be more meticulous and perform a final check to ensure the result is accurate and consistent with the data obtained throughout the problem-solving process.

Discussion

Critical thinking dispositions in the aspects of truth-seeking and systematic thinking are not only theoretically important but also empirically observable in students' problem-solving processes. The findings of this study indicate that students demonstrate a relatively adequate ability to identify and use accurate data; however, they tend to lack consistency in verifying or re-evaluating their reasoning. This result partially supports the findings of Wangensteen et al. (2010), who argue that a strong truth-seeking disposition enhances the application of critical thinking in practice. In contrast, the present study reveals that even when students are able to reach correct answers, the absence of reflective verification suggests that truth-seeking is not fully internalized as a habitual disposition. This finding extends the work of Kurniati et al. (2020), who view truth-seeking as a learnable disposition, by showing that the learning process may successfully develop procedural accuracy but not necessarily reflective evaluation. Furthermore, while Zeb et al. (2022) emphasize the role of collaborative learning in strengthening truth-seeking, this study highlights that individual written responses still show gaps in self-verification, suggesting that truth-seeking may manifest differently across learning contexts.

In terms of systematic thinking, the findings show that students are generally able to organize solution steps in a logical and coherent manner and use mathematical

notation appropriately, although inconsistencies and lack of final checking remain evident. This aligns with Huang (2023), who found that the systematic dimension often lags behind other aspects of critical thinking despite adequate overall performance. However, this study provides a more nuanced insight by demonstrating that students' systematic thinking tends to be procedural rather than reflective. While Bell and Loon (2015) argue that systematic thinking supports reflective judgment and more profound understanding, the present findings indicate that students' systematic processes are primarily focused on reaching answers rather than evaluating them. Similarly, although Wei and Hu (2018) suggest that structured learning environments promote systematic thinking, this study implies that structure alone is insufficient to foster the habit of checking and validating results. Therefore, systematic thinking in this context appears to be partially developed, particularly in the execution stage, but weak in the evaluation stage.

This study also contributes to the broader discussion about the relationship between critical thinking dispositions and cognitive development. While Li (2024) highlights the reciprocal relationship between early dispositions and future critical thinking ability, the findings of this study suggest that not all components of disposition develop simultaneously. Specifically, students may acquire the ability to use correct procedures (cognitive skill) without fully developing dispositions such as verification and reflection. This suggests a potential disconnect between cognitive competence and dispositional readiness, a topic that previous studies have not adequately addressed.

The primary contribution of this study is its micro-level analysis of students' written responses and interview data, elucidating the manifestation of truth-seeking and systematic dispositions in real problem-solving contexts. Unlike prior studies that primarily rely on survey-based measurements, this research demonstrates that correct answers do not necessarily indicate strong critical thinking dispositions. Instead, it shows that students may achieve correct results while still lacking essential dispositional elements, such as reevaluation and answer verification. These findings suggest that instructional practices should not only focus on procedural accuracy but also explicitly cultivate reflective habits, particularly in checking and validating solutions. In the context of teacher education, this insight is crucial, as emphasized by Kurniati et al. (2019), because future educators need not only to solve problems correctly but also to model critical and reflective thinking processes for their students.

Conclusions and Suggestions

This study concludes that students' critical thinking dispositions in the aspects of truth-seeking and systematic thinking remain at a procedural level and have not yet fully developed into reflective thinking. Students are able to organize data, follow logical steps, and arrive at correct answers; however, they show weaknesses in verifying assumptions and evaluating final results. These findings highlight a gap

between procedural competence and the depth of critical thinking dispositions, indicating that correct answers do not necessarily reflect strong critical thinking. This study theoretically contributes to the understanding that critical thinking encompasses not only cognitive skills but also reflective habits that require explicit development. Practically, the findings imply that instruction should focus on correct answers and encourage students to recheck their work, question assumptions, and reflect on their reasoning process. Therefore, future teaching practices and research should place greater emphasis on developing the reflective and evaluative aspects of students' critical thinking dispositions.

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