Students' Critical Thinking in Solving Numeracy Problems: A Case Study of Students with High Self-Efficacy

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Abstract

Critical thinking is a 21st century skill that allows students to think reflectively and reason in making decisions. Students' critical thinking influences success in solving numeracy problems. This study aims to explain the ability to think critically in solving numeracy problems with high self-efficacy. The study employed a qualitative approach and phenomenological method. Data collection involved the use of the Group Embedded Figures Test (GEFT), self-efficacy questionnaires, and numeracy assessments in mathematics, specifically on topics related to cubes and rectangular prisms. Data analysis comprised data condensation, data presentation, and conclusion drawing. Based on GEFT and self-efficacy questionnaire results, one class V-B student with a field-dependent cognitive style and high self-efficacy was selected for further critical thinking skills assessment. Based on the results the student with a field-dependent cognitive style and high self-efficacy demonstrated notable strengths. In the process of basic clarification, the student met the indicators for analyzing arguments and formulating statements, effectively presenting their arguments. When providing reasons for decisions, the student showed the ability to consider the credibility of sources by selecting appropriate problem-solving strategies. However, she occasionally made calculation errors due to inaccuracy. In the process of concluding, the student met the indicators for making and evaluating decisions, successfully composing conclusion sentences that aligned with the problems and final answers. Students with field dependent cognitive style and high self efficacy are able to fulfill all indicators of critical thinking by using their ability to solve critical thinking problems. He excelled in verbal ability at the time of the interview by explaining the argument of the problem and the answer, but his weakness is less thorough in working so that the results obtained are less precise.

Keywords: critical thinking ability, numeracy, self-efficacy.

The advancement of the 21st century is characterized by prioritizing knowledge as the primary driver of progress. The National Education Association has identified 21st-century skills as the "4Cs," encompassing critical thinking, creativity, communication, and collaboration (Rönnlund, Ledman, Nylund, & Rosvall, 2019). In the era of globalization or the 21st century, individuals are required to undergo fundamental changes in personal quality. Society is expected to utilize critical thinking and knowledge to address and solve problems (Yustitia & Juniarso, 2019 ;Lin, Hu, & Chiu, 2020). Furthermore, 21st-century education emphasizes student-centered learning, aiming to equip students with essential cognitive skills,

including (1) critical thinking, (2) problem-solving, (3) metacognition, (4) communication, (5) collaboration, (6) innovation and creativity, and (7) information literacy. Among these skills, critical thinking stands out as one of the most crucial.

In everyday life, individuals consistently require critical thinking skills to resolve the problems they encounter. Similarly, students frequently employ critical thinking skills to tackle challenges in their learning, especially in mathematics. This is supported by Wardani et al. (2021), who noted that mathematics education often presents problems similar to those in daily life. Students with strong critical thinking skills can solve these problems, thus practicing and enhancing their abilities. Consequently, students with a critical mindset can effectively process and manage the information or issues they face. Critical thinking guides individuals toward more precise and effective thought processes, making it indispensable for activities such as teaching and learning.

Critical thinking and problem-solving are fundamentally interlinked and cannot be separated. Polya conceptualized problem-solving as the endeavor to find a solution to a given difficulty (Kozikoğlu, 2019). It is an individual activity aimed at navigating obstacles when a clear method for discovering the answer is not readily available. Hence, critical thinking equips students with the means to devise solutions to problems.

Numeracy challenges, which entail the comprehension and application of fundamental mathematical concepts, frequently pose difficulties for elementary school students (Gal, Grotlüschen, Tout, & Kaiser, 2020). To address numeracy issues effectively, students need not only a solid foundation in mathematics but also well-developed critical thinking skills (Kusmaharti, Pramulia, & Yustitia, 2023). Such skills enable students to discern and apply appropriate strategies for resolving a wide array of mathematical problems.

Numeracy is the ability to identify, use, interpret, and communicate mathematical problems in various contexts (Brown & O'Keeffe, 2016). The main components in numeracy are content, context, and cognitive processes (Forgasz & Hall, 2017). Cognitive processes consist of understanding, application, and reasoning. Content consists of Geometry and measurement, Algebra, Data and uncertainty, and Numbers. Context consists of personal, scientific, and socio-cultural. Numeracy does not only develop basic mathematical skills about numbers, but can be in the form of broad abilities such as measuring; implementing and interpreting information; and critical mathematical thinking (Forgasz & Hall, 2019).

In learning, each student approaches problem-solving uniquely, influenced by their method of receiving information and their environment, collectively known as cognitive style. Cognitive style encompasses the learning methods and attitudes that significantly affect academic performance (Fadilah & Winarso, 2021). Individuals' cognitive styles vary based on their comprehension type, categorized as either field-dependent or field-independent. Field-dependent individuals typically exhibit higher confidence and independence, while field-independent types tend to rely more on external factors (Son, Darhim, & Fatimah, 2020). This study specifically focuses on the field-dependent cognitive style.

One salient factor influencing motivation to address numeracy problems is self-efficacy. Self-efficacy denotes an individual's conviction in their capacity to execute and orchestrate the requisite actions to attain designated objectives (Yustitia & Kusmaharti, 2024). The development of critical thinking skills also hinges on fostering self-efficacy and a belief in one's respective abilities, commonly referred to as self-efficacy. Self-efficacy plays a crucial role in alleviating anxiety and uncertainty when tackling educational challenges (Öztürk, Akkan, & Kaplan, 2020). According to Nuraeni et al. (2019), self-efficacy correlates with critical

thinking by indicating high confidence in students' capacity to succeed in tasks and excel as critical thinkers. Individuals who cultivate self-efficacy demonstrate confidence in their abilities and a keen interest in learning materials, problem-solving in mathematics, and completing assignments. Higher levels of self-efficacy correspond to increased confidence and enthusiasm in addressing mathematical challenges (Afifah & Kusuma, 2021). Hence, students with elevated self-efficacy are more likely to exhibit enthusiasm, diligence, perseverance, and a proactive approach to completing assigned tasks (Gao, 2020).

Mathematics education inherently involves critical thinking, as it encompasses problems requiring numerical calculations and the application of analytical skills (English, 2023). Most mathematics content for elementary school students is connected to real-life scenarios. For instance, the concept of calculating the volume of geometric solids, such as cubes and rectangular prisms, is a key component. In the fifth-grade curriculum, this topic is addressed in Chapter 6 of the odd semester under the MERDEKA Curriculum. This study specifically examines the volume of cubes and rectangular prisms, as these geometric solids present mathematical challenges that require critical thinking for effective problem-solving. Volume is defined as the measurement of the space an object occupies, encompassing three dimensions: length, width, and height. In mathematics, volume calculations are used to determine the capacity of three-dimensional objects such as cubes and rectangular prisms. The volume of these shapes is typically calculated using the formula: base area × height, where the base area is derived from length × width. Consequently, the formula for the volume of a cube is $s \times s \times s$, and the formula for a rectangular prism is $l \times w \times h$. Solving problems related to volume requires critical thinking skills, with evaluations based on specific criteria.

Research related to students' critical thinking abilities, particularly those with field-dependent cognitive styles and high self-efficacy, reveals several relevant findings. Edianto et al. (2022) demonstrated that students with field-independent cognitive styles perform differently compared to those with field-dependent styles. Specifically, students with a field-independent cognitive style can effectively document their understanding and questions (interpretation), analyze the relationships between concepts (analysis), follow appropriate steps to arrive at correct answers (evaluation), and draw logical conclusions from their findings (inference). In contrast, students with a field-dependent cognitive style typically meet only three out of these four indicators: interpretation, analysis, and evaluation. Supporting this, Risdianah (2022) found a link between self-efficacy and critical thinking, noting that self-efficacy affects critical thinking levels and is associated with variations in accuracy. Students with high self-efficacy generally meet all four critical thinking indicators but may struggle with precision in interpreting questions. Those with moderate self-efficacy typically meet three indicators but are prone to errors due to hastiness, lack of attention, and insufficient experience in concluding. Conversely, students with low self-efficacy often meet only two indicators, frequently demonstrate imprecision in calculations, and address problems with hesitation. Hidayat & Noer (2021) found that students with high self-efficacy exhibit superior mathematical critical thinking skills compared to their low self-efficacy counterparts.

Based on the preceding discussion and findings, it is evident that there is a gap in research concerning the critical thinking abilities of students with a field-dependent cognitive style and high self-efficacy. The researchers posit that a field-dependent cognitive style and high self-efficacy substantially influence students' critical thinking skills in mathematics education, warranting a more comprehensive investigation. Consequently, the researchers aim to explore this topic further in the study titled "Students' critical thinking in solving numeracy problems: a case

study of students with high self-efficacy" It is anticipated that this research may provide deeper insights into students' understanding and self-confidence, thereby enhancing their critical thinking skills in elementary education.

METHOD

This study employed a descriptive qualitative research design with a phenomenological approach. Qualitative research aims to provide a comprehensive understanding of phenomena (Miles, Huberman, & Sahdana, 2014). The primary objective of this study was to explore and describe the critical thinking abilities of students with a field-dependent cognitive style and high self-efficacy. Conducted at SD Negeri Ngagel Rejo 1 Surabaya, the research focused on fifth-grade students from class V-B for the 2023–2024 academic year. The study involved a single participant who demonstrated a field-dependent cognitive style and high self-efficacy. Data collection was facilitated through three instruments: the Group Embedded Figure Test (GEFT), a self efficacy questionnaire, and a numeracy assessment. Cognitive style questionnaire and self-efficacy questionnaire were used to select research subjects. Numeracy assessment is used to explore critical thinking skills.

Group Embedded Figure Test (GEFT)

The Group Embedded Figure Test (GEFT) is designed to categorize students' cognitive styles as either field-dependent (FD) or field-independent (FI). Developed by Witkin et al. (1971), the GEFT requires students to identify simple geometric shapes embedded within more complex figures. The test comprises 25 items to be completed within a specified time limit and is divided into three sections: the first section includes 7 practice items, while the second and third sections each consist of 9 assessment items.

Scoring for the GEFT starts from the second session, where each correct response is assigned 1 point and each incorrect response receives 0 points. The highest possible score is 18 points. Students scoring ≤ 11 are classified as having a field-dependent (FD) cognitive style, while individuals scoring ≥ 11 are classified as having a field-independent (FI) cognitive style (Ridwanah & Masriyah, 2021). The scoring categories for cognitive styles are summarized in the table below.

Table 1: Cognitive Style Scoring Categories

Cognitive Style	Criteria
Field Dependent (FD)	$0 \geq 11$
Field Independent (FI)	$11 \leq 18$

Self-Efficacy Questionnaire

The self-efficacy questionnaire comprises 35 items, categorized into two sections: 18 positive statements and 17 negative statements. These items are organized into three dimensions: (1) Level: This dimension assesses task completion, task difficulty, and optimism in handling tasks; (2) Strength: This dimension evaluates persistence in learning, perseverance in task execution, and consistency in achieving goals; (3) Generality: This dimension examines mastery of assigned tasks, understanding of learning material, and time management skills (Bandura, 2006). The breakdown of items in the self-efficacy questionnaire is outlined in the table below.

Table 2: Self-Efficacy Questionnaire Items

Dimensions	Item Number
Level	1 to 12
Strength	13 to 24
Generality	25 to 35

The assessment of students' self-efficacy scores employs a questionnaire with Likert scale calculations, as detailed in the following table.

Table 3: Likert Scale Scoring for Self-Efficacy Questionnaire

Responses	Statement Scoring	
	Positive	Negative
Strongly Agree (SA)	4	1
Agree (A)	3	2
Disagree (D)	2	3

Responses	Statement Scoring	
	Positive	Negative
Strongly Disagree (SD)	1	4

The Likert scale scores are assigned based on student's responses to each item. Total scores are then calculated, followed by averaging the scores for each student. The students' self-efficacy levels are subsequently determined from the questionnaire data by calculating the mean score, computing standard deviation, and categorizing the scores into high, medium, and low. The criteria for self-efficacy categorization are presented in the table below.

Table 4. Self-Efficacy Criteria

Self-Efficacy Levels	Criteria
High	Students with a self-efficacy score $\geq \bar{x} + SD$
Medium	Students with a self-efficacy score between $\bar{x} + SD$ and $\bar{x} - SD$
Low	Students with a self-efficacy score $\leq \bar{x} - SD$

Source: (Ramadhani, 2020)

Critical Thinking with Numeracy Test

This study utilizes a critical thinking test consisting of three essay questions focusing on the volume of cubes and rectangular prisms. These questions are designed as word problems relevant to everyday life and are accompanied by contextual illustrations. The numeracy test questions has been validated by two expert. Here is question number 3 in this study.

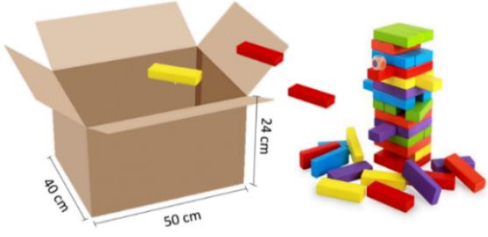

Figure 1: Question Number 3 of the Numeracy Test

Nizam's wooden block stacking toys will be put into a block-shapes cardboard box with the size as shown in the picture. Each wooden block toy is 5 cm long, 4 cm wide and 8 cm high. How many wooden block toys can be put into the box until it is full?

The test results are further analyzed using modified indicators of critical thinking based on Ennis' theory as cited in Arif et al. (2020). The specific critical thinking indicators applied in this research are outlined below.

Table 5: Critical Thinking Indicators

No.	Aspects	Indicator
1.	Basic Clarification	Analyzing arguments Formulating questions
2.	The Bases for a Decision	Considering the credibility of sources
3.	Inference	Making and evaluating value judgments

The collected data are then subjected to descriptive-qualitative analysis, following the model by Miles and Huberman as cited in (Miles et al., 2014). This model encompasses data condensation, data display, and conclusion drawing. The sequence of this data analysis process is depicted in the following figure.

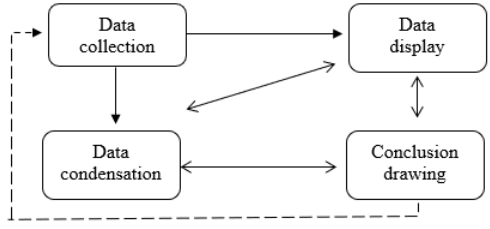

Figure 2. The Flow of Data Analysis

This research began by administering the Group Embedded Figure Test (GEFT) to the fifth-grade students of Class V-B at SD Negeri Ketintang 1 Surabaya. The test results were analyzed to classify students into field-dependent and field-independent cognitive styles. Students identified as having a field-

dependent cognitive style then completed a self-efficacy questionnaire. Based on the questionnaire analysis, students were categorized into high, medium, and low self-efficacy groups, with those demonstrating high self-efficacy being selected. One student who exhibited both a field-dependent cognitive style and high self-efficacy was chosen as the subject. This subject subsequently took a critical thinking test focused on the volume of cubes and rectangular prisms and participated in an in-depth interview to provide further insights into her critical thinking abilities.

RESULT AND DISCUSSION

Results

Based on the results of the GEFT (Group Embedded Figure Test) administered to 24 fifth-grade students in Class V-B at SD Negeri Ngagel Rejo 1 Surabaya, 19 students exhibited a field-dependent cognitive style, while 5 students demonstrated a field-independent cognitive style. The students with a field-dependent cognitive style subsequently completed a self-efficacy questionnaire, revealing that 5 of them possessed high self-efficacy.

Following this, the researchers conducted interviews with the teacher or homeroom teacher of Class V-B to assess the critical thinking abilities of these 5 students. NRHA was selected as the subject based on the teacher's assessment of superior critical thinking skills. NRHA underwent a critical thinking test focused on the volume of cubes and rectangular prisms, along with an interview. The criteria used to select this subject are detailed in the table below.

Table 6: Research Subjects

Subject Name	Cognitive Style Category	Self-Efficacy Category
NRHA	Field Dependent	High

According to the data analysis, the subject successfully addressed questions 1, 2, and 3 following critical thinking indicators. However, due to a lack of carefulness, errors were made in mathematical calculations.

- Question Number 1

In this question, the student was tasked with describing three spatial structures (cubes and rectangular prisms) depicted in a contextual image of a combined bookshelf and calculating the total volume of the shelf. Presented below is S-NRHA's response to question number 1.

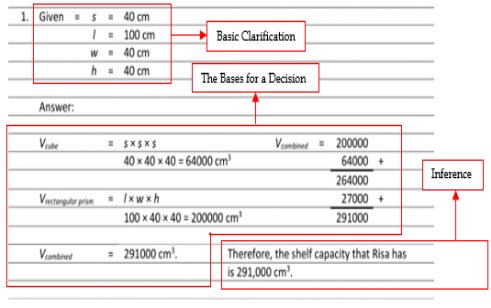

Figure 3: Answer to Question Number 1

Basic Clarification Process

This process involves indicators such as analyzing arguments and formulating questions. Below is an excerpt from the researchers' interview with S-NRHA.

Table 7: Interview Excerpt on Basic Clarification Process for Question Number 1

Label	Interview Excerpts	Indicator
P	Let's focus on question number one. What do you understand after reading the question?	
S-NRHA	*There's a shelf with rectangular prisms and cubes.*	
P	How many shelves are rectangular prisms and how many are cubes? Show me!	Analyzing arguments
S-NRHA	*There are 2 rectangular prisms and 1 cube.*	
P	How do you determine that these shelves are rectangular prisms and cubes?	
S-NRHA	*The picture in the question resembles rectangular prisms and cubes.*	
P	Show me the dimensions of rectangular prism 1!	

S-NRHA	*It's 100 cm long, 40 cm wide, and 40 cm high.*	
P	Explain where you obtained these numbers!	
S-NRHA	*The length is 100 cm, the width is 40 cm as stated in the question, and the height is 40 cm. Subtracting 40 cm from the cube's side gives us 40 cm.*	
P	All right, now show me rectangular prism 2 and its dimensions.	
S-NRHA	*It's 30 cm high, 40 cm wide, and 60 cm long.*	
P	Could you explain how you arrived at those measurements?	
S-NRHA	*It's 30 cm tall, 40 cm wide as mentioned in the question, and 60 cm long. Subtracting 40 cm from 100 cm gives us 60 cm.*	
P	All right, what are the dimensions of the cube?	
S-NRHA	*It's 40 cm.*	
P	How do you know this shelf is cube-shaped?	
S-NRHA	*Because each side measures 40 cm.*	
P	Why does your current answer differ from what's written on the answer sheet?	
S-NRHA	*I focused on answering initially without rechecking what was provided.*	
P	What issue did you encounter with the question? Please explain your perspective!	
S-NRHA	*I determined the shelf capacity owned by Rissa, as indicated in the question.*	Formulating questions
P	Why wasn't the question included in the answer sheet?	
S-NRHA	*I forgot to double-check my answer.*	

Based on the interview excerpt, S-NHRA demonstrates strong analytical skills in interpreting the problem image and identifying 2 rectangular prisms and 1 cube based on their respective dimensions. S-NRHA confidently justifies how each side measurement corresponds to the shapes' characteristics: rectangular prisms have lengths, widths, and heights, while cubes have equal-length sides. She details her approach to deriving each dimension through precise subtraction. S-NRHA also accurately formulates questions that address the problem presented. However, she did not verify her answers, leading to incomplete responses compared to the question requirements.

Process of Justifying a Decision

This process involves assessing the credibility of a source. Below is an excerpt from an interview with S-NRHA conducted by the researchers.

Table 8: Excerpt from Interview on the Process of Justifying a Decision for Question Number 1

Label	Interview Excerpts	Indicator
P	Based on your understanding of the question, how did you approach solving the problem?	
S-NRHA	*I calculated the volume of the cube = $s \times s \times s = 40 \times 40 \times 40 = 64{,}000\ cm^3$, volume of rectangular prism 1 = $l \times w \times h = 100 \times 40 \times 40 = 200{,}000\ cm^3$, and volume of rectangular prism 2 = $l \times w \times h = 60 \times 40 \times 30 = 72{,}000\ cm^3$. Then, I added these three volumes together.*	
P	Could you explain why you added these volume results together?	
S-NRHA	*Because I needed to find the total volume of the combined shelves.*	
P	What is the total if these three volumes are added together?	Considering the credibility of a source
S-NRHA	*(reviewing the calculation result from the answer sheet) 200,000 + 64,000 + 27,000 = 291,000 cm^3.*	
P	Is this the correct answer?	
S-NRHA	*Yes, it is correct.*	
P	Upon reviewing your answer, why did you choose this particular method to solve the problem? What was your reasoning?	
S-NRHA	*I chose this method to determine the capacity of the bookshelf space. The capacity is equivalent to the total volume of the shelves.*	

S-NRHA demonstrated the ability to consider the credibility of the analyzed question, both in terms of the provided information and the problem statement, enabling the application of a problem-solving strategy. Utilizing the volume formula appropriate to the shapes of the spatial structures, S-NRHA calculated and summed the volumes. However, S-NRHA did not clarify the logical reasoning behind the addition process, indicating uncertainty. In her calculations, S-NRHA made errors due to carelessness, leading to inaccurate final results. Specifically, errors were noted in calculating the volume of rectangular prism 1, which resulted in 200,000 cm3 instead of the correct 160,000 cm3. Additionally, when summing the combined volumes, S-NRHA calculated 200,000 cm3 + 64,000 cm3 + 27,000 cm3 = 291,000 cm3 instead of the correct 160,000 cm3 + 64,000 cm3 + 72,000 cm3 = 296,000 cm3.

Process of Drawing Conclusions

This process involves indicators of making and evaluating value judgments. Below is an interview excerpt with S-NRHA conducted by the researchers.

Table 9: Interview Excerpt on the Process of Drawing Conclusions for Question Number 1

Label	Interview Excerpts	Indicator
P	Based on the answer you worked on with that approach, what can be concluded?	Making and evaluating value judgments
S-NRHA	*In conclusion, Rissa's shelf capacity is 291,000 cm^3.*	
P	Please explain if the conclusion drawn aligns with the question and answer!	
S-NRHS	*Yes, it does align because the shelf capacity derived from the combined volume answer is 291,000 cm^3.*	

The interview excerpt above demonstrates that S-NRHA can articulate a conclusion that corresponds to the final answer derived from the combined volume of 291,000 cm3, despite the actual answer being incorrect. S-NRHA also accurately explains the rationale behind the conclusion.

- Question Number 2

In question number 2, the student was tasked with identifying the spatial structure based on the provided dimensions of a bathtub and calculating the remaining volume of water required. Below is S-NRHA's response to question number 2.

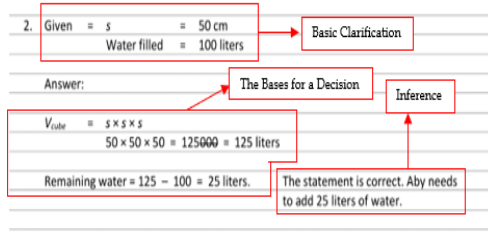

Figure 4: Answer to Question Number 2

Basic Clarification Process

This process involves indicators such as analyzing arguments and formulating a question. Below is an excerpt from the researchers' interview with S-NRHA.

Table 10: Interview Excerpt on Basic Clarification Process for Question Number 2

Label	Interview Excerpts	Indicator
P	Considering question number 2, what do you understand after reading the question?	
S-NRHA	*The bathtub is 50 cm wide and currently holds 100 liters of water. To add another 25 liters to fill it, we need to determine the volume of a cube.*	Analyzing arguments
P	All right, so we need to find the volume of a cube. What resembles a cube? How do you know it's a cube?	

S-NRHA	*It's the bathtub because only one side of the bathtub is shown in the picture. The other sides are not mentioned in the question, so its dimensions must be equal, similar to those of a cube.*	
P	Okay, as you mentioned earlier, the bathtub has a "width" of 50 cm. If you're talking about "finding the volume of a cube", does a cube have a width like a rectangular prism?	
S-NRHA	*No, I meant its side was 50 cm, not its width.*	
P	What is the issue in the question?	
S-NRHA	*Should Aby add another 25 liters of water to fill it?*	Formulating questions
P	Why wasn't this question addressed in your answer sheet?	
S-NRHA	*Yes, earlier, I forgot to write it down.*	

S-NRHA demonstrates an effective analysis of the question image. She identifies the bathtub's shape as a cube based on the image, where only one side displays 50 cm, leading her to conclude that the other sides are of equal length, characteristic of a cube. S-NRHA also frames a question statement that accurately reflects the problem and explains its relevance. However, on her answer sheet, S-NRHA failed to record the specific question or its formulation due to oversight in verification.

Process of Justifying a Decision

This process involves indicators of considering the credibility of a source. Below is an interview excerpt with S-NRHA conducted by the researchers.

Table 11: Excerpt from Interview on the Process of Justifying a Decision for Question Number 2

Label	Interview Excerpts	Indicator
P	Based on your understanding of the question, what method will you employ to solve it?	
S-NRHA	*I will use the method of calculating the volume of a cube.*	
P	So, to determine the remaining water needed to fill it, do you need to calculate the volume of a cube? Why? Please explain your reasoning!	
S-NRHA	*Because I am calculating the remaining water required to fill the bathtub, considering it is shaped like a cube.*	Considering the credibility of a source
P	Can the liter unit effectively measure volume? Please elaborate!	
S-NRHA	*Yes, because the liter is a standard unit of volume.*	
P	All right, what comes next?	
S-NRHA	*Volume = $s \times s \times s = 50 \times 50 \times 50 = 125{,}000\ cm^3 = 125$ liters. The remaining water amounts to 125 liters minus the 100 liters already filled, resulting in 25 liters.*	
P	Why subtract the volume of the cube from the water already in the bathtub?	
S-NRHA	*To determine the additional amount needed to fill it.*	

S-NRHA demonstrates proficiency in devising problem-solving strategies based on acquired information, exemplified by employing the volume formula for a cube due to the measurement of water in liters. S-NRHA confidently asserts that liters serve as a unit of volume, thereby substantiating the rationale behind selecting this approach. Subsequently, the outcome is derived by subtracting the calculated volume from the amount of water already present. S-NRHA executes the computations accurately, yielding the precise volume of additional water required.

Process of Drawing Conclusions

This phase entails assessing and formulating value-based judgments. Below is an excerpt from the researchers' interview with S-NRHA.

Table 12: Interview Excerpt on the Process of Drawing Conclusions for Question Number 2

Label	Interview Excerpts	Indicator

P	Based on the method you employed in your answer, how do you conclude?	Making and evaluating value judgments
S-NRHA	*Aby needs to add 25 liters of water.*	
P	Will adding 25 liters fill the bathtub?	
S-NRHA	*Yes, it will.*	
P	Does your conclusion align with the question and the resultant answer?	
S-NRHS	*Yes, it does. Adding 25 liters to fill the bathtub is accurate based on the subtraction of the bathtub's volume and the pre-filled water.*	

It can be seen that S-NRHA explains the conclusions drawn with appropriate considerations, specifically the final answer obtained from subtracting the volume of the bathtub and the filled water. Additionally, the conclusion is written comprehensively and accurately on the answer sheet.

- Question Number 3

In question number 3, the student was asked to determine the number of wooden block toys that can be placed in a box until it is filled. There is a contextual image of wooden block toys to help the subject visualize the problem in the question. Below is S-NRHA's answer to question number 3.

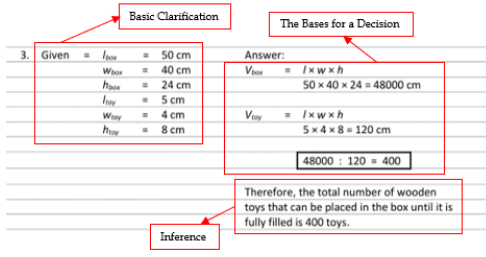

Figure 5: Answer to Question Number 3

Basic Clarification Process

This process involves indicators such as analyzing arguments and formulating answers to the question. Below is an excerpt from the interview with S-NRHA.

Table 13: Interview Excerpt on Basic Clarification Process for Question Number 3

Label	Interview Excerpts	Indicator
P	Now look at question number three! What can you understand after reading the question?	Analyzing arguments
S-NRHA	*Nizam's wooden stacking blocks will be placed in a box shaped like a rectangular prism as shown in the image. The blocks have a length of 5 cm, a width of 4 cm, and a height of 8 cm.*	
P	What are the dimensions of the box?	
S-NRHA	*The box has a length of 50 cm, a width of 40 cm, and a height of 24 cm.*	
P	The toys will be placed in the box. Do you think they will be arranged neatly or just put in haphazardly? What do you think?	
S-NRHA	*I think they'll be put in haphazardly.*	
P	Can all the toys fit if they are put in haphazardly, as suggested by the story problem?	
S-NRHA	*Yes, they can all fit.*	
P	Explain your opinion on what the problem in this question is!	Formulating questions
S-NRHA	*The problem is to determine how many wooden block toys can be placed in the box until it is filled.*	
P	You didn't write down the question for number 3 on your answer sheet either, why?	
S-NRHA	*Yes, I didn't check my answer again.*	

It is evident from the interview excerpt that S-NRHA did not fully grasp the problem in the question, as she assumed the wooden stacking blocks would be placed haphazardly and fill the box, rather than being arranged neatly and completely. Nevertheless, S-NRHA understands the dimensions of each block, such as length, width, and height, as well as the dimensions of the box. S-NRHA is also capable of formulating the problem statement as required by the

question. However, she did not write down the question on the answer sheet.

Process of Justifying a Decision

This process involves considering the credibility of a source. Below is an excerpt from the researchers' interview with S-NRHA.

Table 14: Excerpt from Interview on the Process of Justifying a Decision for Question Number 3

Label	Interview Excerpts	Indicator
P	After reading and understanding the question, how will you solve it?	Considering the credibility of a source
S-NRHA	*Calculate the volume of the box. Volume of the box = length × width × height = 50 × 40 × 24 = 48,000 cm^3. Now, calculate the volume of the wooden block: Volume of the block = length × width × height = 5 × 4 × 8 = 120cm^3. Then, divide the volume of the box by the volume of the block = 48,000 ÷ 120 = 400.*	
P	Look at your answer again! Is calculating the volume the correct method to solve this problem? Explain!	
S-NRHA	*Yes, it is, to determine the volume of the box and the toys.*	
P	Why is it necessary to divide the volume of the box by the volume of the toys?	
S-NRHA	*To know how many toys can fit into the box.*	

Based on the interview excerpt above, it is evident that S-NRHA is capable of using the information obtained to solve the problem with an appropriate strategy. However, S-NRHA was unable to provide a logical explanation for the choice of strategy, merely stating that it was to determine the volume and to fit the toys into the box. Additionally, S-NRHA made a calculation error: the volume of the wooden block toy should be p × l × t = 5 × 4 × 8 = 160 cm3, not 120 cm3. Therefore, the correct division of the box's volume by the volume of the wooden block toy is 48,000 cm3 ÷ 160 cm3 = 300 toys.

Process of Drawing Conclusions

This process involves indicators of making and evaluating value judgments. Excerpts from the interview can be seen in the following table.

Table 15: Interview Excerpt on the Process of Drawing Conclusions for Question Number 3

Label	Interview Excerpts	Indicator
P	Based on the method of solving and the answer you obtained, what is your conclusion for the problem in question number 3?	Making and evaluating value judgments
S-NRHA	*The number of wooden block toys that can be placed in the box until it is filled is 400 toys.*	
P	Does the conclusion you reached align with the question and the answer? Explain!	
S-NRHS	*Yes, it does. The result of 400 toys came from dividing their volumes.*	

It is evident from the interview that S-NRHA is capable of formulating and explaining a conclusion sentence based on the final answer obtained from dividing the box volume and the toy volume, despite the incorrect final result.

Discussion

In the indicator of analyzing arguments in each question number 1, 2, and 3, the student with a field-dependent cognitive style and high self-efficacy is capable of understanding the information in the questions and contextual images. She can articulate all the information she obtains. According to Astuti et al. (2023), students with a field-dependent (FD) cognitive style can accurately present all the information in the questions and correctly and completely identify facts throughout the entire problem. Students with high self-efficacy easily discover new information from existing clues to be used in problem-solving. This is consistent with findings by Ningsih et al. (2023) that learners with high self-efficacy can provide simple explanations to determine further strategies.

In formulating the problem statement indicator for each question (numbers 1, 2, and 3),

the student exhibiting a field-dependent cognitive style and high self-efficacy often fails to note down the questions asked in her answer sheets due to her lack of double-checking. However, during interviews, she demonstrates the ability to articulate the problem based on the question formulation. The student with high self-efficacy exhibits strong verbal skills and confidently presents her arguments.

Within the context of assessing source credibility across questions 1, 2, and 3, the student characterized by a field-dependent cognitive style and high self-efficacy demonstrates adeptness in selecting appropriate problem-solving strategies based on gathered information. Misbahudin (2019) supports this notion, positing that individuals with strong critical thinking skills tend to achieve accurate solutions in mathematical tasks, largely due to their robust self-efficacy, which influences their decision-making proficiency. Nevertheless, instances of calculation errors in questions 1 and 3 have resulted in incorrect outcomes. This finding resonates with the observations of Astuti et al. (2023), highlighting that students with a field-dependent cognitive style may occasionally exhibit lapses in meticulousness during problem-solving processes, thereby compromising the accuracy of their conclusions.

Within the framework of making and evaluating value judgments across questions 1, 2, and 3, the student exhibiting a field-dependent cognitive style and high self-efficacy demonstrates proficiency in concluding. She achieves this by carefully weighing the outcomes obtained and the inherent complexities of the problem. The student is adept at logically articulating the nexus between their deliberations and the conclusion sentence.

The table below presents the conclusions drawn from critical thinking assessments of research subjects or students exhibiting a field-dependent cognitive style and high self-efficacy, analyzed according to critical thinking indicators.

Table 16: Critical Thinking Abilities of Students with Field-Dependent Cognitive Style and High Self-Efficacy

Critical Thinking Process		Question 1	Question 2	Question 3
Basic Clarification	Analyzing Arguments	✓	✓	✓
	Formulating a Problem Statement	✓	✓	✓
Providing Reasons for a Decision (Considering the Credibility of a Source)		-	✓	-
Drawing Conclusions (Making and Evaluating Value Judgments)		✓	✓	✓

In the process of basic clarification, the student with a field-dependent cognitive style and high self-efficacy demonstrates the ability to comprehensively analyze the arguments presented in questions 1, 2, and 3 by providing detailed explanations for each question's information. Additionally, she is adept at formulating questions based on the problem statements. However, she often fails to fully document both the known information and the questions posed in their answer sheets. During the process of concluding questions 1, 2, and 3, the student with a field-dependent cognitive style and high self-efficacy can articulate conclusions, considering both the outcomes and the essence of the problem, both verbally and in writing on her answer sheets.

When providing rationales for decisions, the student with a field-dependent cognitive style and high self-efficacy successfully addresses question 2 by selecting logical strategies and delivering precise mathematical calculations. Nevertheless, in questions 1 and 3, despite choosing appropriate problem-solving strategies, she tends to make calculation errors that lead to inaccurate final results.

The results of this study contribute to education in Indonesia in the form of a description of the critical thinking profile of elementary school students with high self-efficacy in solving numeracy problems. The results of this study can be used as evaluation material for designing learning to improve students' critical thinking in solving numeracy problems. In line with several previous research results, self-efficacy has a positive effect on numeracy (Cheema, 2018; Yustitia, Siswono, & Abadi, 2021; Yustitia, Siswono, & Abadi, 2022).

One salient factor influencing motivation to address numeracy problems is self-efficacy. Self-efficacy—or the self-assured belief in one's ability to accomplish specific tasks—constitutes a pivotal psychological determinant in the advancement of critical thinking abilities. Bandura posits that self-efficacy shapes how individuals confront and surmount challenges, particularly within academic contexts (Demir & Onyedi, 2022). Students exhibiting high self-efficacy are typically more resolute and adept in navigating and resolving problems, including those related to numeracy (Zhu & Chiu, 2019).

Numeracy challenges, which entail the comprehension and application of fundamental mathematical concepts, frequently pose difficulties for elementary school students (Norton, 2019). To address numeracy issues effectively, students need not only a solid foundation in mathematics but also well-developed critical thinking skills. Such skills enable students to discern and apply appropriate strategies for resolving a wide array of mathematical problems.

CONCLUSION

The student characterized by a field-dependent cognitive style and high self-efficacy demonstrates proficiency in tackling critical thinking challenges associated with analyzing arguments. She adeptly identifies and references comprehensive information essential for problem resolution. However, the student frequently neglects to fully transcribe this information onto her answer sheets. Furthermore, her discoveries are substantiated through calculations aligning with geometric properties. The student proficiently articulates problem statement formulations, aiding in her strategic problem-solving approach. Nevertheless, due to lapses in attention, she often omits these formulations from her answer sheets.

Despite her ability to select appropriate problem-solving strategies based on the accuracy of problem information, the student occasionally commits calculation errors. Consequently, this leads to inaccuracies in her outcomes, undermining the accuracy of her problem-solving efforts. Moreover, the student with a field-dependent cognitive style and high self-efficacy excels in formulating and presenting conclusion statements alongside her calculated results.

ACKNOWLEDGMENTS

The author would like to thank the Rector of Universitas PGRI Adi Buana Surabaya, LPPM Universitas PGRI Adi Buana Surabaya, Lembaga Layanan Pendidikan Tinggi Wilayah VII, Direktorat Riset, Teknologi dan Pengabdian Masyarakat dan Pengabdian kepada Masyarakat Kementerian Pendidikan, kebudayaan, Riset, dan Teknologi who have supported this research through grant funding from the Fundamental Grant Scheme program with the main contract number 034/SP2H/PT/LL7/2024 and derivative contract 070.23/Kontrak/LPPM/VI/2024.

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