



Analysis of Prospective Mathematics Teachers' Critical Thinking Disposition Based on Self-Confidence

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Abstract: The disposition of critical thinking plays an important role for teachers, particularly in responding to mathematical problems. However, several studies have shown that the disposition to think critically is still low. This descriptive-qualitative research aims to analyze and describe prospective mathematics teachers' critical thinking dispositions based on their self-confidence. Three subjects were selected from a total of 25 prospective mathematics teachers who were given a self-confidence questionnaire, with very good, good, and poor self-confidence criteria. Data collection was conducted by administering a critical thinking disposition test of the *Problems With No Specified Universal Set Given* (PWNSUS) type and conducting interviews. The results of this research indicate that prospective mathematics teachers' self-confidence influences their critical thinking disposition. Prospective mathematics teachers with very good self-confidence fulfill the components of a critical thinking disposition, namely systematicity, self-confidence, inquisitiveness, open-mindedness, and analyticity. Meanwhile, prospective mathematics teachers with good self-confidence fulfill the components of self-confidence, inquisitiveness, open-mindedness, and analyticity. However, prospective mathematics teachers with poor self-confidence only fulfill inquisitiveness and analyticity. Two of the three subjects were unable to achieve two critical thinking components, namely truth and maturity, which can be developed through various exercises.

INTRODUCTION

Critical thinking is one of the most important skills of the 21st Century (Alismail & McGuire, 2015; Basri et al., 2019; Brown, 2015; Changwong et al., 2018; Lamb et al., 2017). The fact is that critical thinking has been agreed upon as the main goal in the academic field, especially in higher education. Critical

thinking has two important components: abilities and dispositions (Barta et al., 2022; Ennis, 1991; Fitriani et al., 2018; Nieto & Valenzuela, 2012). Critical thinking ability is a manifestation of a person's critical thinking disposition. Kurniati & As'ari (2021) argue that the disposition to think critically plays a

crucial role in developing a person's critical thinking skills.

In this sense, it is necessary to improve the disposition to think critically in mathematics learning needs to be improved in order to make students become critical thinkers. On the contrary, if the disposition to think critically is still lacking, it will affect the abilities to observe and analyze carefully resulting in decisions that are taken to be less precise (Kurniati & As'ari, 2021).

Critical thinking disposition comprises seven components: truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, maturity, and inquisitiveness (Aybek & Aslan, 2017; Bakir, 2015; Facione & Facione, 1992; Karagöl & Bekmezci, 2015; Lampert, 2007; Nurzain et al., 2017). Many researchers commonly employ standardized instruments like the California Critical Thinking Disposition Inventory (CCTDI) to measure these components.

However, the instrument above is still general and its content is not mathematical. As'ari et al. (2019) stated that to measure and to improve critical thinking disposition in mathematics can use two type problems: Problems with Contradiction Information (PWCI) or Problems with No Specified Universal Set Given (PWNSUS).

For reasons, including the findings of Hasanah et al. (2022) and Mutmainah et al. (2021) concerning Problems With Contradiction Information (PWCI), this study will utilize Problems With No Specified Universal Set Given (PWNSUS) to identify the critical thinking disposition of prospective mathematics teachers. The use of PWNSUS certainly can broaden the scope of identifying mathematical critical thinking dispositions so that later it is able to add to our scientific repertoire regarding critical thinking dispositions.

Several previous studies, including those by Agustianti (2021); Dianita et al.

(2017); Miatun & Khusna (2019); Mutmainah et al. (2021); Nursyam (2020), have examined the analysis of critical thinking dispositions. However, no research has specifically investigated critical thinking dispositions in the context of self-confidence. Confidence has an important function to actualize one's potential (Rahmi et al., 2017; Sumarmo et al., 2018; Winarso et al., 2018). People who have good self-confidence tend to be optimistic and confident in the competence they have. This ability also will encourage them to do their best to achieve the desired goals.

Specifically, students of Mathematics Education at Universitas Madura tend to display low self-confidence. This can be seen when the learning process takes place students do not seem confident in conveying their ideas. It further has the impacts on the students' ability to think critically. However, it is still lack of the research that has been conducted on this matter. Therefore, it is necessary to conduct research on this issue, utilizing valid instruments to measure both the students' critical thinking dispositions and their self-confidence.

Hendriana et al. (2017) in the book *Hard Skills and Soft Skills* argued that the indicators of confidence comprise of a) believing in one's own abilities; b) always be positive in dealing with problems; c) act independently in making decisions; d) have a positive self-concept; and e) dare to express opinions. In this research, the indicators used to identify the self-confidence of prospective teacher students used four of from five indicators as presented by Hendriana.

Based on the above problem description, it is crucial to examine the critical thinking disposition of prospective mathematics teachers with respect. Thus, this research aims to analyze and describe the disposition of prospective mathematics' critical thinking in terms of self-confidence.

METHOD

This research was conducted during the odd semester of the 2022/2023 academic year with 25 prospective mathematics teachers in their 7th semester at the Universitas Madura. The research method employed in this study is descriptive with a qualitative approach. Qualitative research examines the way in which people make sense out of their own concrete, real-life experiences in their own minds and in their own words and subsequently analyze this understanding in terms of behavioral sciences such as psychology, sociology, politics, education, health or science, business and management, decision-making, or innovation, to give some examples (Cropley, 2022). The goal of this descriptive research is to describe a phenomenon and its characteristic (Nassaji, 2015).

The obtained qualitative data were then analyzed to derive insights about the prospective mathematics teacher's critical thinking dispositions, with a focus on self-confidence, in solving Problems With No Specified Universal Set Given

(PWNSUS). The study participants comprised three prospective mathematics teachers, each falling into different categories of self-confidence: very good, good, and poor. The criteria for participant selection were based on the classification of self-confidence levels. Additionally, participants were selected considering their communication skills to ensure smooth progression during the interview process.

The instruments utilized in this research included non-test instruments, namely a student self-confidence questionnaire, and test questions designed as Problems With No Specified Universal Set Given (PWNSUS) to examine critical thinking dispositions. The initial stage conducted by the researchers involved compiling a self-confidence questionnaire for students, adapted from Yusnia (2019).

The self-confidence questionnaire comprised 25 statements with 4 indicators. The statements made include negative statements and positive statements. Table 1 provides an outline of the self-confidence questionnaire administered to the prospective mathematics teachers.

Table 1. Prospective Mathematics' Teacher Questionnaire Outline

No	Confidence Indicator	Statement		Number of questions
		Positive	Negative	
1	Believe in your own abilities	1,12,24	6,17	5
2	Act independently in making decisions	2,13,18, 25	7, 8, 19	7
3	Have a positive self-concept	3, 4, 14, 15	9, 20, 21	7
4	Dare to express your opinion	5, 16, 22	10, 11, 23	6
Number of items		14	11	25

Each statement is accompanied by five response options: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). Scoring for positive statements follows the order: SA = 5, A = 4, N = 3, D = 2, SD = 1, while negative statements are scored in reverse order. The questionnaire was distributed through Google Forms. This approach was taken to simplify response collection from prospective mathematics teachers and to facilitate researchers in

analyzing data related to the classification of the participants' confidence levels. The analysis of the questionnaire data on the prospective mathematics teachers' self-confidence in this study employed the percentage analysis technique suggested by Muhamad (2016).

After calculating the percentage value, the prospective mathematics teachers will be classified into various levels of self-confidence based on the

classifications defined by Surya et al. (2017), as illustrated in Table 2.

Table 2. Classification of Prospective Math Teacher Self-Confidence Levels.

No	Classification	Percentage
1	Very good (VG)	81% - 100%
2	Good (G)	61% - 80%
3	Poor (P)	41% - 60%
4	Not Good (NG)	21% - 40%
5	Worst (W)	0% - 20%

The subsequent instrument employed in this study is a test designed to evaluate the critical thinking dispositions of prospective mathematics teachers. As reported by As'ari et al. (2019), there are two types of problems that can be used to identify and enhance critical thinking dispositions in mathematics: Problems with Contradictory Information (PWCI) and

Problems with No Specified Universal Set Given (PWNSUS). However, this study utilizes the Problems with No Specified Universal Set Given (PWNSUS) type to identify critical thinking dispositions.

The analysis of critical thinking dispositions in this study draws on the components defined by Facione (1990) and Redhana et al. (2017). According to Facione, there are seven components of critical thinking dispositions: truth-seeking, open-mindedness, analyticity, systematicity, maturity, self-confidence, and inquisitiveness. These seven components will be further probed through interviews with the chosen participants to verify the consistency of their responses. The indicators of critical thinking disposition employed in this study are presented in Table 3.

Table 3. Indicators of Critical Thinking Disposition.

Component	Indicator
Truth-seeking	Doesn't accept all information unquestioningly.
Systematicity	Has a tendency or habit to systematically document the steps involved in a process to enable clear tracking.
Self-confidence	Shows a tendency to trust their reflective thinking when making decisions.
Open-mind	Accepts differing viewpoints as long as they are logically justified.
Analyticity	Exhibits sensitivity to the potential outcomes once a fact is accepted as truth.
Inquisitiveness	Demonstrates curiosity and willingness to learn something new, regardless of its immediate applicability.
Maturity	Strikes a balance between the capability to solve complex problems and the need to adhere to provided time constraints.

The following phase in this study involves data analysis, aligning with the approach proposed by Miles et al. (2014) which encompasses data reduction, data presentation, and conclusion drawing. Data reduction involves selecting the core elements that align with the study's theme and pattern to provide a clearer depiction. Data presentation entails organizing data into tables or other formats to facilitate reader comprehension, with the final step being the drawing of conclusions.

RESULT AND DISCUSSION

On December 12, 2022, the researchers disseminated a Google Form link designed to assess the confidence level of prospective mathematics teachers. This method generated data on Self Confidence (SC) from 25 Prospective Mathematics Teachers (PMT) at Universitas Madura, the percentages of which are clearly presented in Table 4. Drawing from these results, a subsequent classification of the teachers' self-confidence levels was diligently conducted.

Table 4. Percentage of Prospective Mathematics Teachers' Self-confidence.

PMT	SC (%)
1	67 %
2	59 %
3	72 %
4	71 %
5	82 %
6	85 %
7	66 %
8	65 %
9	66 %
10	70 %
11	70 %
12	80 %
13	75 %
14	58 %
15	76 %
16	58 %
17	63 %
18	67 %
19	66 %
20	61 %
21	61 %
22	79 %
23	64 %
24	82 %
25	76 %

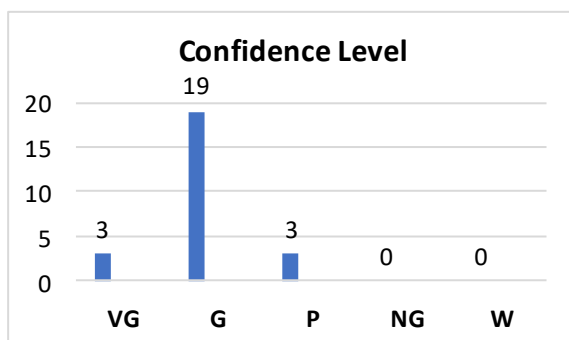


Figure 1. Results of the Classification of Prospective Mathematics Teachers' Self-confidence Levels.

The categorization of prospective mathematics teachers' self-confidence levels reveals that none fall into the 'not good' or 'worst' categories. This finding aligns with the study by Nilasari et al. (2020), which reported high self-confidence among students. In contrast, other studies have discovered low self-confidence levels, with one instance showing 93 % (83 students) demonstrating very low self-confidence (Alamsyah & Hakim, 2021).

In this study, three test subjects demonstrated varying degrees of self-confidence: one prospective mathematics teacher (PMT24) had a very good level, another (PMT17) showed a good level, and the last one (PMT14) exhibited a poor level. These individuals were selected for an in-depth examination of their critical thinking disposition. These prospective mathematics teachers were given the PWNSUS test and interviewed on the same day. The subsequent analysis of each subject is detailed in the following sections.

Critical Thinking Disposition Analysis of a Highly Self-Confident Subject (PMT24)

1. Truth-seeking

The transcript below captures the interview between the researcher (R) and a subject with a very high level of self-confidence (PMT24), conducted to identify the subject's pursuit of truth:

R : "Prior to answering the question, kindly read and evaluate the questions given for two minutes. If you have any inquiries or need any clarifications, feel free to ask."
 PMT24 : "Understood, sir."
 R : "(After two minutes) Do you have any questions or require any clarifications about the problem?"
 PMT24 : "None, sir."
 R : "OK, proceed."

Upon analysis, it appears that PMT24 accepted all provided information without questioning. A closer examination reveals that some aspects of the questions, particularly concerning the universe of 'x' and 'y', are unclear. As noted by Basri (2022), Facione et al. (1992), and Kurniati & As'ari (2021), truth-seeking embodies the tendency to avoid accepting information at face value, emphasizing instead the need for evidence and logical reasoning before reaching a decision. Therefore, it can be concluded

that PMT24 does not fully embody the truth-seeking component.

2. Systematicity

Below is a transcript of the interview conducted by the researcher (R) with a subject (PMT24) who demonstrates a very high level of confidence. The interview aimed to identify the systematicity component in PMT24:

- R : "Could you explain the steps you took to arrive at the solution for $x+y = 6$?"
- PMT24 : "Firstly, I identified the points of intersection of the equation with the x-axis and y-axis."
- R : "Could you please demonstrate that once again?"
- PMT24 : "(Working on the provided paper) The intersection points are at (6,0) and (0,6)."
- R : "What did you do next?"
- PMT24 : "I plotted the intersection points on the Cartesian plane and drew it."
- R : "So, what is the solution for $x+y = 6$?"
- PMT24 : "All points on the line $x+y = 6$."

From the interview, it is evident that PMT24 was proficient in recording the solution steps in an organized manner and was capable of explaining each step effectively. According to Basri (2022), Facione et al. (1992), and Kurniati & As'ari (2021), systematicity refers to an individual's habit of recording completion steps in a well-ordered manner to enable clear tracking. Therefore, it can be inferred that PMT24 exhibits the component of systematicity.

3. Self-confidence

The following interview transcript outlines the interaction between the researcher (R) and a subject who exhibits a high level of self-confidence (PMT24). The objective of the interaction was to identify the self-confidence component in PMT24:

- R : "Are you confident in your answer?"
- PMT24 : "(Pauses momentarily to review the answer) Yes, I am."
- R : "Why are you confident in your answer?"
- PMT24 : "Because all the steps I performed are correct."

The interview demonstrates PMT24's conviction in their solution, which is grounded in their confidence in the correctness of the steps they took. As per the research of Basri (2022), Facione et al. (1992), and Kurniati & As'ari (2021), self-confidence is defined as an individual's habitual tendency to trust their reflective thinking when problem-solving and making decisions. Consequently, it can be concluded that PMT24 demonstrates the component of self-confidence.

4. Open-mind

The subsequent transcript pertains to a researcher's (R) interview with a subject (PMT24) demonstrating high self-confidence. The objective was to identify the open-mindedness component:

- R : "According to your solution, all points on the line $x+y=6$ qualify as answers. How would you react to solutions such as (1,5), (2,4), (3,3), (4,2), (5,1) if x and y are natural numbers?"
- PMT24 : "(Pauses momentarily) Yes, those solutions are acceptable if we confine x and y to the domain of natural numbers."

From this, it is evident that PMT24 is open to accepting differing viewpoints, as long as they are underpinned by logical reasoning. As per literature (Basri, 2022; Facione et al., 1992; Kurniati & As'ari, 2021), this inclination towards considering rational, differing opinions exemplifies the 'open-mind' trait. Consequently, it is inferred that PMT24 successfully embodies this component. The answers from PMT24 can be seen in Figure 2.

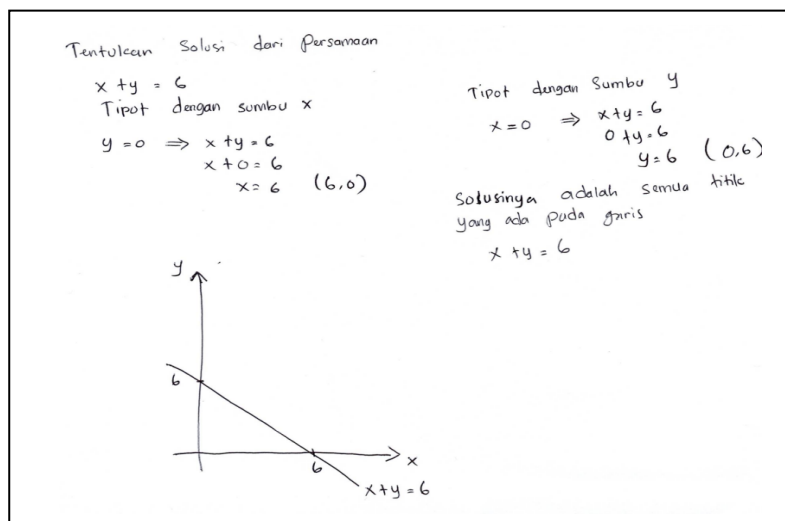


Figure 2. PMT24's Answer

5. Analyticity

The subsequent segment involves an interview conducted by the researcher (R) with a high self-confidence subject (PMT24) to assess the presence of the analytical component:

- R : "Earlier, you agreed that (1,5), (2,4), (3,3), (4,2), (5,1) could be solutions if x and y are natural numbers. What if x and y are negative integers?"
- PMT24 : "(Pauses momentarily) In that case, there are no solutions."
- R : "Can you explain why?"
- PMT24 : "It's impossible for the sum of two negative integers to yield a positive number. Therefore, the domain of x and y profoundly impacts the solution to the equation $x+y=6$."

From this interaction, it becomes clear that PMT24 is quick to contemplate potential ramifications and adjust his understanding accordingly upon acceptance of a new premise. Such propensity to anticipate future consequences, both positive and negative, is indicative of the 'analyticity' component, according to Basri (2022), Facione et al. (1992), and Kurniati & As'ari, (2021). Therefore, it can be inferred that PMT24 indeed possesses the analyticity component.

6. Inquisitiveness

The researcher's (R) interview with the high self-confidence subject (PMT24) helps identify the inquisitiveness component in PMT24.

- R : "Have you previously encountered similar questions?"
- PMT24 : "Yes, however, the problem typically specifies the universe."
- R : "Are you intrigued to delve deeper into this topic?"
- PMT24 : "Absolutely, particularly since I haven't explored it before."

The interview reveals PMT24's inclination towards learning about unexplored topics, demonstrating a curiosity and desire for knowledge. This aligns with the definition of 'inquisitiveness', as presented by Basri (2022), Facione et al. (1992), and Kurniati & As'ari, (2021), which is a habitual desire to learn, even if not immediately. This suggests that PMT24 exhibits the inquisitiveness component.

7. Maturity

The following presents the researcher's (R) interview with the highly confident subject (PMT24), focusing on identifying the maturity component:

- R : "You mentioned earlier that the universe x, y influences the

- solution of $x+y = 6$."*
- PMT24 : "Yes, Sir."
- R : "In the question provided, there is no explicit mention of the universe of x and y . Why did you not specify the boundaries of x and y before answering?"
- PMT24 : "(Appears confused) The question did not provide any explanation, so I assumed it to be a real number, sir."

The interview reveals that PMT24 tends to use personal assumptions in problem-solving. Basri (2022), Facione et al. (1992), and Kurniati & As'ari (2021) define maturity as an individual's habit of recognizing complexity and striving to make appropriate decisions. From the evidence presented, it can be inferred that PMT24 does not exhibit the maturity component.

Analysis of Critical Thinking Disposition of Subjects with a Good Level of Self-Confidence (PMT17)

1. Truth-seeking

The following presents the results of an interview conducted by a researcher (R) with subjects who demonstrate a good level of self-confidence (PMT17). The purpose of the interview was to identify the 'truth-seeking' component in PMT17's critical thinking:

- R : "Before answering the question, please read and examine the given questions for 2 minutes. If there's anything you wish to ask or clarify, feel free to do so."
- PMT17 : "Yes, Sir."
- R : "(After 2 minutes) Is there anything you would like to ask or clarify about the problem?"
- PMT17 : "No sir."
- R : "OK, please proceed."

Based on the interview, it was observed that PMT17 accepted all the provided information directly without thorough scrutiny. Upon closer inspection, the information provided was notably unclear, especially regarding the universes of x and y . According to Basri

(2022); Facione et al. (1992); Kurniati & As'ari, (2021), 'truth-seeking' refers to a tendency to evaluate information rather than accepting it outright, emphasizing evidence and logical reasoning in decision-making. Therefore, it can be concluded that PMT17 has not fulfilled the 'truth-seeking' component of critical thinking.

2. Systematicity

The following presents the results of a researcher's interview (R) with a subject who exhibits a good level of self-confidence (PMT17). The purpose was to identify the 'Systematicity' component in PMT17's critical thinking:

- R : "Could you explain the steps you took to solve the equation $x+y = 6$?"
- PMT17 : "First, I input the value of x and then find the value of y ."
- R : "Could you try solving it again, please?"
- PMT17 : "(Works on the provided paper and shows the answer)"
- R : "Are there any other potential solutions to the equation $x+y=6$?"
- PMT17 : "(Responds hesitantly) No, sir."
- R : "What if $x=2.5$, what would be the value of y ?"
- PMT17 : "The value of y would be 3.5, sir."
- R : "Isn't the pair $x=2.5$ and $y=3.5$ a solution?"
- PMT17 : "Yes, sir."

From the interview, it is clear that PMT17 has not been able to properly articulate each step taken. According to Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021), 'Systematicity' refers to a person's tendency to record the steps taken to solve a problem in an orderly manner for clear tracking. Thus, it can be concluded that PMT17 has not fulfilled the 'Systematicity' component of critical thinking.

3. Self-confidence

The following presents the results of a researcher's interview (R) with a subject

who exhibits good self-confidence (PMT17). The purpose was to identify the 'Self-confidence' component in PMT17's critical thinking:

- R : "Are you confident in your answer?"
 PMT17 : "(Thinks for a moment while reviewing the answer) Yes, sir."
 R : "Why are you confident in your answer?"
 PMT17 : "Because I have written down all possible solutions, sir."

From the interview, it is evident that PMT17 is confident in the answers provided. According to Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021), 'Self-confidence' refers to a person's habitual tendency to trust in reflective thinking for problem-solving and decision-making. Therefore, it can be concluded that PMT17 fulfills the 'Self-confidence' component of critical thinking.

4. Open-mind

The following presents the results of a researcher's interview (R) with a subject who exhibits good self-confidence (PMT17). The purpose was to identify the 'Open-mindedness' component in PMT17's critical thinking:

- R : "(Gives the answer sheet to S17) Are all the x and y solutions that you found integers?"
 PMT17 : "Yes, sir."
 R : "If $x=2.5$, what is the value of y ?"
 PMT17 : " $y=3.5$, sir."
 R : "Are $x=2.5$ and $y=3.5$ a solution?"
 PMT17 : "(Answering hesitantly) Yes, sir."
 R : "Why is it a solution?"
 PMT17 : "Because if $x+y=6$, sir."
 R : "Why didn't you write it as a solution?"
 PMT17 : "I thought only integers, sir."
 R : "Do x and y have to be integers?"
 PMT17 : "Oh, I see, they don't have to be, sir."

From the interview, it is apparent that PMT17 accepts differing opinions when they are rational. According to Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021), 'Open-mindedness' refers to a person's tendency to accept differing opinions as long as they are logical and rational. Therefore, it can be concluded that PMT17 exhibits the 'Open-mindedness' component of critical thinking. The answers from PMT17 can be seen in the Figure 3.

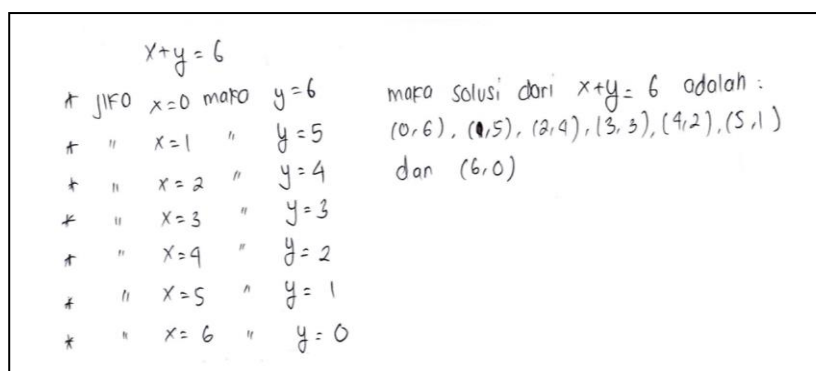


Figure 3. PMT17's Answer

5. Analyticity

The following presents the results of a researcher's interview (R) with a subject who exhibits a good level of confidence (PMT17). The aim was to identify the

'Analyticity' component in PMT17's critical thinking:

- R : "You said that $x=2.5$ and $y=3.5$ are also solutions?"
 PMT17 : "Yes, sir."
 R : "Are there any other solutions?"

PMT17 : "Many, sir."
 R : "Could you please mention some?"
 PMT17 : "x=1.5 and y=4.5 or x=3.3 and y=2.7, and many others, sir."

From the interview, it is evident that PMT17 shows sensitivity towards the potential outcomes of an accepted truth. As defined by Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021), 'Analyticity' refers to the tendency to anticipate the potential positive and negative consequences of future events. Therefore, it can be concluded that PMT17 exhibits the 'Analyticity' component of critical thinking.

6. Inquisitiveness

The following are the results of a researcher's interview (R) with a subject exhibiting a good level of self-confidence (PMT17), aiming to identify the 'Inquisitiveness' component in PMT17:

R : "Have you previously encountered questions like this one?"
 PMT17 : "Yes, sir, I have."
 R : "Are you interested in learning more about the solutions to two-variable linear equations?"
 PMT17 : "Yes, sir."

From the interview, it is clear that PMT17 demonstrates a keen interest in expanding their knowledge. PMT17 tends to engage more deeply with intriguing subjects. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) suggested that 'Inquisitiveness' is a habitual tendency to seek a wide range of knowledge, not necessarily immediately or in a rush. Hence, it can be concluded that PMT17 exhibits the 'Inquisitiveness' component of critical thinking.

7. Maturity

The following are the results of a researcher's interview (R) with a subject who has a good level of self-confidence (PMT17), aiming to identify the 'Maturity' component in PMT17:

R : "Earlier you mentioned that the solution is an integer."
 PMT17 : "Yes, sir."
 R : "Why do you say that?"
 PMT17 : "Well, sir, usually the answers to these types of questions are integers."

Based on the interview, it is clear that PMT17 tends to rely on their own assumptions while solving problems. According to Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021), maturity is characterized by an individual's tendency to recognize complexity and strive to make appropriate decisions. As such, it can be concluded that PMT17 has not yet exhibited the 'Maturity' component.

Analysis of Critical Thinking Disposition of Subjects with a Poor Level of Self-Confidence (PMT14)

1. Truth-seeking

The following are the results of the researcher's interview (R) with subjects who have a poor level of self-confidence (PMT14), aimed at identifying the component of seeking truth in PMT14:

R : "Before answering the question, please read and scrutinize the given questions for 2 minutes. If there is anything you wish to ask or clarify, feel free to do so!"
 PMT14 : "Yes, sir."
 R : "(After 2 minutes) Is there anything you would like to ask or clarify about the problem?"
 PMT14 : "No, sir."
 R : "OK, please proceed."

From the interview, it is observed that PMT14 accepts all the provided information directly without closely inspecting the given questions. In fact, upon closer examination, it is clear that the information provided is ambiguous, particularly regarding the universe of x and y. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) stated that seeking truth is a tendency not to merely accept the provided information, but to place more emphasis on evidence and

logical reasoning in decision-making. Thus, it can be concluded that PMT14 has not fulfilled the component of seeking truth.

2. Systematicity

The following presents the results of the researcher's interview (R) with the subjects who have a poor level of self-confidence (PMT14), intended to identify the component of systematicity within PMT14:

- R : "Can you explain the steps you took to find the solution to the equation $x+y = 6$?"
- PMT14 : "First, I identify the intersection points of the equation with the x-axis and y-axis."
- R : "Please try to do it once more!"
- PMT14 : "(Working on the provided paper) The intersection points are (6,0) and (0,6)."
- R : "What did you do next?"
- PMT14 : "I recorded the intersection as a solution to the equation."
- R : "Is the solution to the equation $x+y=6$ only the intersection point with the x and y axes?"
- PMT14 : "(Pauses for a moment and answers hesitantly) I believe so, sir."

From the interview, it can be observed that PMT14 has not been able to explain each step taken adequately. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) highlighted that systematicity is a person's tendency or habit to record the steps of resolution in an organized manner to facilitate clear traceability. Hence, this suggests that PMT14 has not fulfilled the systematicity component.

3. Self-confidence

The following illustrates the results of the researcher's interview (R) with the subjects who demonstrate a poor level of self-confidence (PMT14), aimed at identifying the self-confidence component in PMT14:

- R : "Are you confident in your answer?"

- PMT14 : "(Thinks for a moment while looking at the answer) I'm not sure, sir."
- R : "Why are you uncertain about your answer?"
- PMT14 : "Because typically there are two equations, sir."

Based on the interview, it can be observed that PMT14 was uncertain about the answers provided due to a lack of experience in solving such questions. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) defined self-confidence as an individual's habitual tendency to trust their reflective thinking when solving problems and making decisions. Therefore, it can be concluded that PMT14 does not meet the self-confidence component.

4. Open-mind

The following presents the results of the researcher's interview (R) with subjects demonstrating a poor level of self-confidence (PMT14), aiming to identify the open-mindedness component within PMT14:

- R : "(Hands the answer sheet to PMT14) Your answers and solutions are (0,6) and (6,0)."
- PMT14 : "Yes, sir."
- R : "Are (1,5) or (2,4) not solutions?"
- PMT14 : (Silence and looks confused)
- R : "What do you think?"
- PMT14 : "No, sir. As far as I'm aware, the solution is the point of intersection."
- R : "If the sum of the values is 6, does it not count as a solution?"
- PMT14 : "No, sir, because it is not a point of intersection."

From the interview, it is clear that PMT14 has not accepted differing perspectives, even when the answers are logically correct. PMT14 even harbors a misconception regarding the definition of a solution, which needs immediate attention and scaffolding to prevent recurrence (Anghileri, 2006; Asiawati et al., 2019). Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021)

described open-mindedness as an individual's tendency to accept differing perspectives from others, as long as these perspectives are logical and rational. Therefore, it can be concluded that

PMT14 has not fulfilled the open-mindedness component. The answers from PMT17 can be seen in the Figure 4.

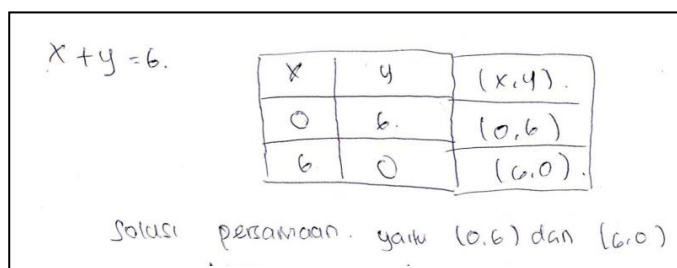


Figure 4. PMT17's Answer

5. Analyticity

The following presents the results of the researcher's interview (R) with subjects who exhibit a poor level of self-confidence (PMT14), aimed at identifying the analyticity component within PMT14:

- R : "You mentioned earlier that (1,5) is not a solution to $x+y=6$?"
- PMT14 : "Yes, sir."
- R : "I want to confirm again, if you examine it closely, isn't $1+5=6$ sufficient to qualify $x=1$ and $y=5$ as a solution to $x+y=6$?"
- PMT14 : "(Seems doubtful) But that's not the point of intersection, sir."
- R : "Why can it not be a solution if it's not a point of intersection?"
- PMT14 : "It is not considered a solution, sir."

From the interview, it is clear that PMT14 is not yet sensitive to potential future implications. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) defined analyticity as the tendency to consistently anticipate the positive and negative consequences of future events. Therefore, this suggests that PMT14 has not fulfilled the analyticity component.

6. Inquisitiveness

The following illustrates the results of the researcher's interview (R) with subjects displaying a poor level of self-confidence (PMT14), aimed at identifying

the inquisitiveness component within PMT14:

- R : "Have you encountered this type of question before?"
- PMT14 : "As I've mentioned, sir, typically there are two questions."
- R : "Are you interested in exploring this material further?"
- PMT14 : "Yes, sir. I have not studied this material before."

Based on the interview, it is clear that PMT14 exhibits a desire to learn about things they have not previously known. PMT14 has a tendency to learn about interesting subjects. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) asserted that inquisitiveness is a habitual tendency to desire knowledge about many things, even if not immediately or directly. Therefore, it can be concluded that PMT14 fulfills the inquisitiveness component.

7. Maturity

The following presents the results of the researcher's interview (R) with subjects demonstrating a poor level of confidence (PMT14), aimed at identifying the maturity component within PMT14:

- R : "You stated earlier that the solution is the intersection point of the equation."
- PMT14 : "Yes, sir."
- R : "Why do you believe that?"
- PMT14 : "Well, sir, if there are two equations, then the solution is

the intersection point."
 R : "In this case, there is only one equation. Is the solution still the intersection point?"
 PMT14 : "(Appears confused) Yes, sir. Since there is only one equation, the intersection points are on the x and y axes."

From the interview, it can be observed that PMT14 tends to rely on personal assumptions in problem-solving. Basri (2022); Facione et al. (1992); Kurniati & As'ari, (2021) described

maturity as an individual's habit of recognizing complexity and striving to make appropriate decisions. Therefore, it can be concluded that PMT14 has not fulfilled the maturity component.

Based on the analysis, the following provides a summary of prospective mathematics teachers' critical thinking dispositions, as determined by their level of self-confidence.

Table 5. Recapitulation of Prospective Mathematics' Teacher Critical Thinking Dispositions based on Self-Confidence

Component	Self-Confidence		
	Very Good	Good	Poor
Truth-seeking	-	-	-
Systematicity	√	-	-
Self-confidence	√	√	-
Open-mind	√	√	-
Analyticity	√	√	√
Inquisitiveness	√	√	√
Maturity	-	-	-

As evidenced by Table 5, there is a relationship between self-confidence and the critical thinking dispositions of prospective mathematics teachers. Notably, an enhanced level of self-confidence correlates with a stronger disposition towards critical thinking. This observation aligns with the findings of several studies conducted by Melyana & Pujiastuti (2020); Tresnawati et al. (2017); Nurkholifah et al. (2018); and Wijiasih & Awalludin (2022), all of which established a positive effect of self-confidence on critical thinking skills.

The "Truth-seeking" component, however, is not universally exhibited among the research subjects, irrespective of whether their self-confidence is very high, good, or poor. This observation aligns with the findings of Kurniati et al. (2019), Rohmah et al. (2022), Widananti (2022), and Ghadi et al. (2015), all of which identified a low prevalence of the "Truth-seeking" component in thinking dispositions.

CONCLUSION

This research underscores the influence of self-confidence on the critical thinking dispositions of prospective mathematics teachers. It has been observed that those with very high self-confidence demonstrate a fulfillment of critical thinking disposition components, specifically systematicity, self-confidence, inquisitiveness, open-mindedness, and analyticity. Those with good self-confidence manifest self-confidence, inquisitiveness, open-mindedness, and analyticity as key components of their critical thinking disposition. However, prospective mathematics teachers with poor self-confidence only embody two critical thinking disposition components: inquisitiveness and analyticity. Of the seven components that define critical thinking disposition, the seeking of truth and maturity remain elusive to prospective mathematics teachers, regardless of their high, medium, or low self-confidence. These components provide areas for further development,

and their enhancement can be targeted through various exercises.

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REFERENCES

- Agustianti, R. (2021). Analisis disposisi matematis mahasiswa dengan menggunakan model pembelajaran CORE (connecting, organizing, reflecting, extending). *Jurnal Pembelajaran Matematika Inovatif*, 4(6), 1405–1412. <https://doi.org/10.22460/jpmi.v4i6.1405-1412>
- Alamsyah, & Hakim, L. (2021). Pengaruh kepercayaan diri terhadap kecemasan pada mahasiswa akhir Universitas Teknologi Sumbawa. *Psimawa*, 4(2), 104–109. <https://doi.org/10.1234/jp.v4i2.1436>
- Alismail, H. A., & McGuire, P. (2015). 21st century standards and curriculum: Current research and practice. *Journal of Education and Practice*, 6(6), 150–155.
- Anghileri, J. (2006). Scaffolding practices that enhance mathematics learning. *Journal of Mathematics Teacher Education*, 9(1), 33–52. <https://doi.org/10.1007/s10857-006-9005-9>
- As'ari, A. ., Kurniati, Di., Maharani, S., & Basri, H. (2019). *Ragam soal matematis untuk mengembangkan disposisi berpikir kritis* (1st ed.). Universitas Negeri Malang.
- Asiawati, L., Badruttamam, B., Hidayat, A., & Basri, H. (2019). Analisis kesalahan siswa dan pemberian scaffolding pada materi operasi bilangan bulat. *Ibriez : Jurnal Kependidikan Dasar Islam Berbasis Sains*, 4(2), 207–2016. <https://doi.org/10.21154/ibriez.v4i2.75>
- Aybek, B., & Aslan, S. (2017). The relationship between prospective teachers' critical thinking dispositions and their educational philosophies. *Universal Journal of Educational Research*, 5(4), 544–550. <https://doi.org/10.13189/ujer.2017.050403>
- Bakir, S. (2015). Critical thinking dispositions of pre-service teachers. *Educational Research and Review*, 10(2), 225–233. <https://doi.org/https://doi.org/10.5897/ERR2014.2021>
- Barta, A., Fodor, L. A., Tamas, B., & Szamoskozi, I. (2022). The development of students critical thinking abilities and dispositions through the concept mapping learning method – A meta-analysis. *Educational Research Review*, 37(5), 100481. <https://doi.org/10.1016/j.edurev.2022.100481>
- Basri, H. (2022). *Berpikir dan bernalar matematis* (1st ed.). Eureka Media Aksara.
- Basri, H., Purwanto, P., As'ari, A. R., & Sisworo, S. (2019). Investigating critical thinking skill of junior high school in solving mathematical problem. *International Journal of Instruction*, 12(3), 745–758. <https://doi.org/10.29333/iji.2019.12345a>
- Brown, B. (2015). Twenty first century skills: A bermuda college perspective. *Voices in Education Student Success: A National Focus*, 1, 58–64.
- Changwong, K., Changwong, A., & Sisan, B. (2018). Critical thinking skill development: Analysis of a

- new learning management model for Thai high schools. *Journal of International Studies*, 11(2), 37–48.
- Cropley, A. (2022). *Qualitative research methods: A practice-oriented introduction*. Editura Intaglio.
- Ennis, R. H. (1991). Critical thinking. In *Teaching Philosophy* (pp. 5–24).
- Facione, N. C., & Facione, P. A. (1992). *The california critical thinking disposition inventory*. California Academic Press.
- Facione, P. A. (1990). Critical thinking : A statement of expert consensus for purposes of educational assessment and instruction executive summary “ The Delphi Report”. *The California Academic Press*, 423, 1–19.
<https://doi.org/10.1016/j.tsc.2009.07.002>
- Facione, P. A., Giancarlo, C. A., Facione, N. C., & Gainen, J. (1992). The California critical thinking disposition inventory: CCTDI test manual. *Inquiry: Critical Thinking Across the Disciplines*, 10(2), 20–20.
<https://doi.org/10.5840/inquiryctnews199210292>
- Fitriani, H., Asy’ari, M., Zubaidah, S., & Mahanal, S. (2018). Critical thinking disposition of prospective science teachers at IKIP Mataram, Indonesia. *Journal of Physics: Conference Series*, 1108, 012091.
<https://doi.org/10.1088/1742-6596/1108/1/012091>
- Ghadi, I. N., Bakar, K. A., & Njie, B. (2015). Influences of critical thinking dispositions on critical thinking skills of undergraduate students at a Malaysian Public University. *Journal of Educational Research and Reviews*, 3(2), 23–31.
- Hasanah, S. I., Basri, H., Jannah, U. R., Sa’adiyah Sy, E. N., & Lanya, H. (2022). Teacher’s self-regulation in solving the problem with contradiction information. *Jurnal Didaktik Matematika*, 9(1), 111–124.
<https://doi.org/10.24815/jdm.v9i1.25203>
- Hendriana, H., Rohaeti, E. E., & Sumarmo, U. (2017). *Hard skills dan soft skills matematik siswa* (1st ed.). Refika Aditama.
- Karagöl, İ., & Bekmezci, S. (2015). Investigating academic achievements and critical thinking dispositions of teacher candidates. *Journal of Education and Training Studies*, 3(4), 86.
<https://doi.org/https://doi.org/10.11114/jets.v3i4.834>
- Kurniati, D., & As’ari, A. R. (2019). The truth-seeking and open-mindedness of pre-service mathematics teachers in the solution of non-routine problems. *International Journal of Instruction*, 12(1), 915–930.
<https://doi.org/10.29333/iji.2019.12159a>
- Kurniati, D., & As’ari, A. R. (2021). *Disposisi berpikir kritis dalam pembelajaran matematika* (A. Fauzi (ed.); 1st ed.). Duta Media Publishing.
- Lamb, S., Maire, Q., & Doecke, E. (2017). *Key skills for the 21st century: An evidence-based review*. State of New South Wales.
- Lampert, N. (2007). Critical thinking dispositions as an outcome of undergraduate education. *The Journal of General Education*, 56(1), 17–33.
- Melyana, A., & Pujiastuti, H. (2020). Pengaruh kepercayaan diri terhadap kemampuan berpikir kritis matematis siswa SMP. *JPMI*, 3(3), 239–246.
- Miatun, A., & Khusna, H. (2019). Kemampuan berpikir kritis matematis berdasarkan disposisi matematis. *AKSIOMA: Jurnal Program Studi Pendidikan*

- Matematika*, 9(2), 269–278.
- Miles, M. B., Huberman, M., & Saldana, J. (2014). *Qualitative data analysis: A methods sourcebook*. Sage Publications.
- Muhamad, N. (2016). Pengaruh metode discovery learning untuk meningkatkan representasi matematis dan percaya diri siswa. *Jurnal Pendidikan Universitas Garut*, 10(1), 75–90. <https://doi.org/http://dx.doi.org/10.52434/jp.v10i1.83>
- Mutmainah, S., Faradiba, S. S., & Alifiani, A. (2021). Analisis disposisi berpikir kritis matematis peserta didik dengan tipe soal PWCI (problems with contradictory information). *Jurnal Penelitian, Pendidikan, Dan Pembelajaran*, 16(1), 35–48.
- Nassaji, H. (2015). Qualitative and descriptive research: Data type versus data analysis. *Language Teaching Research*, 19(2), 129–132. <https://doi.org/10.1177/1362168815572747>
- Nieto, A. M., & Valenzuela, J. (2012). A study of the internal structure of critical thinking dispositions. *Spring*, 27(1), 31–38.
- Nilasari, A., Effendi, M. M., & Putri, O. R. U. (2020). Analisis self-confidence dan hasil belajar matematika SMA dalam kurikulum berbasis unit kegiatan belajar mandiri. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, 9(2), 433–439.
- Nursyam, A. (2020). Deskripsi disposisi matematis mahasiswa ditinjau dari perbedaan gender. *AN-NISA: Jurnal Studi Gender Dan Anak*, 12(2), 679–688. <https://doi.org/10.30863/annisa.v12i2.666>
- Nurzain, J., Yunarti, T., & Djalil, A. (2017). Deskripsi disposisi pemahaman konsep matematis siswa dalam pembelajaran socrates saintifik. *Jurnal Pendidikan Matematika*, 5(6), 820–831.
- Rahmi, S., Nadia, R., Hasibah, B., & Hidayat, W. (2017). The relation between self-efficacy toward math with the math communication competence. *Infinity Journal*, 6(2), 177. <https://doi.org/10.22460/infinity.v6i2.p177-182>
- Redhana, I. W., Karyasa, I. W., & Atrisa, N. P. F. (2017). Development of critical thinking disposition inventory. *Proceedings of the 2nd International Conference on Innovative Research Across Disciplines (ICIRAD 2017)*, 195–198. <https://doi.org/10.2991/icirad-17.2017.37>
- Rohmah, L. M., Suwito, A., & Safrida, L. N. (2022). Truth-Seeking siswa dalam menyelesaikan masalah bangun ruang sisi datar dengan tipe soal PWCI (problems with contradictory information). *Jurnal Pendidikan: Riset & Konseptual*, 6(2), 358–366. https://doi.org/10.28926/riset_konseptual.v6i2.502
- Sumarmo, U., Mulyani, E., & Hidayat, W. (2018). Mathematical communication ability and self confidence experiment with eleventh grade students using scientific approach. *JIML-Journal of Innovative Mathematics Learning*, 1(1), 19–30.
- Surya, E., Putri, F. A., & Mukhtar, M. (2017). Improving mathematical problem-solving ability and self-confidence of high school students through contextual learning model. *Journal on Mathematics Education*, 8(1), 85–94.
- Tresnawati, Hidayat, W., & Rohaeti, E. E. (2017). Kemampuan berpikir kritis matematis dan kepercayaan

- diri siswa SMA. *Pasundan Journal of Research in Mathematics Learning and Education*, 2(2), 116–122.
<https://doi.org/10.23969/symmetry.v2i2.616>
- Widananti, E. N. (2022). *Disposisi berpikir kritis berfokus pada truth-seeking peserta didik madrasah aliyah dalam menyelesaikan soal fungsi kuadrat ditinjau dari kemampuan matematika*. Universitas Islam Negeri Maulana Malik Ibrahim.
- Wijasih, A., & Awalludin, S. A. (2022). Analisis kemampuan berpikir kritis matematis siswa ditinjau dari kepercayaan diri. *PROXIMAL*, 5(2), 239–248.
<https://doi.org/doi.org/10.30605/proximal.v5i2.1903>
- Winarso, W., Nurkholifah, S., & Toheri. (2018). Hubungan antara self confidence dengan kemampuan berpikir kritis siswa dalam pembelajaran matematika. *Edumatica: Jurnal Pendidikan Matematika*, 8(1), 58–66.
<https://doi.org/10.22437/edumatica.v8i01.4623>
- Yusnia, K. (2019). *Integritas kepercayaan diri (self confidence) terhadap interaksi sosial siswa Di SMA Muhammadiyah 9 Makasar*. Muhammadiyah Makasar.