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Linking Belief to Thought: A Structural Equation Modeling Analysis of Self-Efficacy and Critical Thinking Among Indonesian Pre-Service Teacher

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Abstract

This study aims to examine the relationship between self-efficacy and critical thinking skills among pre-service teachers in Indonesia. It seeks to provide empirical insights into how beliefs in one's own capabilities influence the propensity for critical thinking within the context of teacher education. A correlational quantitative design was employed, involving 426 pre-service teachers from eight universities across six provinces. Data were collected using the *California Critical Thinking Tendency Scale* and the Teacher Self-Efficacy Scale, and analyzed through Structural Equation Modeling (SEM). The results revealed a significant direct effect of self-efficacy on critical thinking skills, with a coefficient of 0.44. Indirect effects were also observed on sub-factors such as analytical thinking (0.35), open-mindedness (0.35), inquisitiveness (0.33), confidence in reasoning (0.33), truth-seeking (0.33), and systematicity (0.28). Model fit indices—including RMSEA (0.061), CFI (0.98), and TLI (0.97)—indicated a good fit, confirming the model's validity. These findings underscore the importance of strengthening self-efficacy in teacher education programs as a strategic pathway to enhance critical thinking skills among future educators. Furthermore, the study contributes empirical evidence to inform the design of teacher education curricula that prioritize both personal and professional development.

Keywords: critical thinking skills, education culture, educational policymakers, learning communities, project-based learning, reflective teaching, teaching strategy

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1. Introduction

In the context of education, critical thinking skills and self-efficacy are two essential components that significantly influence the effectiveness of the teaching and learning process (Lin et al., 2020). Critical thinking skills enable teachers to evaluate information, construct logical arguments, and make pedagogical decisions reflectively (Facione, 2011), while self-efficacy refers to an individual's belief in their ability to manage and execute learning tasks effectively (Rakhmawati & Mustadi, 2019). Both concepts are crucial in supporting the teacher's role as an adaptive and innovative learning facilitator.

For prospective teachers, mastery of critical thinking and self-efficacy forms the foundation for developing meaningful teaching strategies and fostering a reflective attitude toward classroom challenges. Being an effective teacher requires more than just knowledge of the subject matter; critical thinking skills and self-efficacy beliefs are also necessary (Doğan et al., 2020). Critical thinking disposition, defined as an

individual's tendency to consistently employ reflective and evaluative thinking skills in decision-making, is essential for helping students gain a deep understanding of concepts (Fajari & Chumdari, 2021). Conversely, self-efficacy serves as a motivator, driving prospective teachers to persist through challenges and continuously evaluate and improve their teaching practices (Meera & Jumana, 2015).

Critical thinking skills refer to the ability to understand, analyze, and evaluate arguments or situations rationally (Fajari & Chumdari, 2021), while self-efficacy beliefs entail individuals' confidence in their own abilities to accomplish certain tasks (H. Shi, 2018). Both of these factors play a significant role in determining the quality of a prospective teacher's instruction.

To support the assertion that critical thinking skills and self-efficacy beliefs are essential for effective prospective teaching, various studies have been conducted. For example, a study by Sachdeva & Eggen (2021) found that students' critical thinking skills positively correlated with their achievement. Additionally, research by Meera & Jumana (2015) demonstrated the importance of self-efficacy beliefs in academic performance, showing that students with higher levels of self-efficacy tend to exert more effort and persevere in the face of challenges. Furthermore, a study by Wubbena & Guerra (2017) highlighted the role of teachers' beliefs in shaping instructional practices and student outcomes, emphasizing the significance of teachers' confidence in their teaching abilities. Moreover, the significance of critical thinking skills and self-efficacy beliefs in education is recognized by educational policymakers and practitioners alike. Similarly, the Indonesian Ministry of Education and Culture acknowledges the importance of fostering students' self-efficacy beliefs through various educational initiatives (Rakhmawati & Mustadi, 2019). These efforts reflect a broader understanding within the educational community of the role played by critical thinking skills and self-efficacy beliefs in enhancing learning outcomes.

Examining deeper literature reveals that critical thinking skills and self-efficacy also influence teachers' performance in teaching. Critical thinking skills enable teachers to develop more effective teaching strategies, while high self-efficacy can motivate teachers to overcome challenges encountered in the learning process (Kozikoğlu, 2019). However, in Indonesia, research specifically investigating the relationship between critical thinking skills and self-efficacy among prospective teachers remains limited. One of the primary challenges in education in Indonesia is the lack of emphasis on the development of critical thinking skills (Firdaus et al., 2015). The education system often prioritizes the mastery of concepts mechanically, without providing sufficient opportunities for students to develop their critical thinking skills (Çelik & Özdemir, 2020). As prospective teachers, it is important for them to possess strong critical thinking skills to guide students in understanding concepts deeply.

Furthermore, addressing the gap in research on critical thinking skills and self-efficacy among prospective teachers requires collaborative efforts from policymakers, teacher educators, and researchers (Handican et al., 2022; Rusliah et al., 2021). Establishing mentorship programs and professional learning communities can provide opportunities for pre-service teachers to enhance their critical thinking skills and self-efficacy through peer collaboration and feedback (Vumilia & Semali, 2016).

Additionally, incorporating reflective practices into teacher training programs can help pre-service teachers develop metacognitive awareness and self-regulation skills, which are essential for fostering both critical thinking and self-efficacy in the classroom (Suphasri & Chinokul, 2021).

The fundamental elements of critical thinking delineated in our discussion—consistency, integration, relevance, proficiency, and communication—are indispensable for fostering proficient critical thinking abilities. Consistency in thinking enables individuals to recognize and resolve inconsistencies, ensuring coherence in their logical reasoning process. This aspect is pivotal for upholding rationality and circumventing fallacies (Alsaleh, 2020). Integration entails amalgamating diverse perspectives, evidence, and viewpoints to foster a comprehensive comprehension of a given subject. By considering varied viewpoints, critical thinkers can formulate more holistic arguments and solutions (Evans, 2020). Relevance underscores the practical application of one's comprehension and knowledge in real-world scenarios. By linking theoretical principles with personal encounters and pragmatic contexts, individuals can augment their problem-solving skills (Wrenn & Wrenn, 2009).

Competence refers to the ability to assess one's own knowledge and skills accurately. Critical thinkers possess self-awareness regarding their strengths and weaknesses, allowing them to continuously improve and refine their thinking processes (Kusuma et al., 2022; Tanudjaya & Doorman, 2020). Finally, the ability to communicate effectively is crucial for sharing one's thoughts, ideas, and analyses with others. Clear and concise communication enables critical thinkers to articulate their reasoning, facilitate meaningful discussions, and collaborate with others to generate innovative solutions (Apriliana et al., 2019; Fajari & Chumdari, 2021). Self-confidence is a crucial factor in the quality of teaching, influencing how educators tackle challenges and select teaching strategies (Cardino & Ortega-Dela Cruz, 2020). Prospective teachers with high self-confidence tend to be more assured in selecting suitable strategies to enhance student understanding. Conversely, teachers with low self-confidence may doubt their own abilities and be less effective in classroom management (Rahimi & Karkami, 2015). In the context of education, self-efficacy indicators play a significant role in overcoming challenges and achieving good academic outcomes (Muhtadi et al., 2022). One of the key indicators is the belief in the chosen strategies, which influences students' ability to select and apply appropriate strategies to solve problems (Setiyani et al., 2020).

The self-efficacy dimensions associated with the belief in the ability to solve problems or tasks of varying difficulty levels are also highly significant. Prospective teacher candidates who exhibit high confidence in their ability to tackle diverse subject challenges tend to have higher intrinsic motivation and achieve better academic performance (Gonzalez & Maxwell, 2018; Kurniawati & Noviani, 2022). Moreover, confidence in the effort exerted to solve tasks is another significant dimension of self-efficacy. Learners who believe that their efforts will yield results in the context of education tend to be more persistent in facing difficulties and more adept at overcoming academic obstacles (Masitoh & Fitriyani, 2018; Ryan et al., 2022). Lastly, the self-efficacy dimension related to confidence in abilities across various situations or generality is also an

important aspect. Students with high self-confidence in their abilities overall tend to be more motivated and perform well in various contexts, including outside the classroom (Suren & Ali Kandemir, 2020).

Previous research indicates that critical thinking skills and self-confidence are interrelated factors. Individuals with strong critical thinking skills tend to have higher self-confidence in tackling complex tasks (Pratama, 2020). Conversely, individuals with high self-confidence may be better able to develop their critical thinking skills because they feel more assured in facing intellectual challenges (Nurmalasari et al., 2023). However, in the context of prospective teacher candidates in Indonesia, the relationship between critical thinking skills and self-confidence is not fully understood. Critical thinking skills and self-confidence may be influenced by various factors, including formal education, teaching experience, and social environment (Palavan, 2020). Therefore, it is important to identify the factors affecting critical thinking skills and self-confidence among prospective teachers in Indonesia, as well as the relationship between these two factors. In the Indonesian context, research on the critical thinking skills and self-confidence of prospective teachers remains limited. However, some studies have provided initial insights. For example, research by Gürsan et al., (2022) highlights the importance of developing learning modules that promote critical thinking skills among prospective teachers

Several previous studies have highlighted the importance of critical thinking skills and self-efficacy in education. For instance, Meera & Jumana (2015) demonstrated that self-efficacy is positively correlated with academic performance, while research by Sachdeva & Eggen (2021) found a significant relationship between critical thinking skills and learning achievement. On the other hand, studies by Kozikoğlu (2019) and Wubbena & Guerra (2017) revealed that teachers with high self-efficacy tend to have more reflective instructional practices and are more responsive to students' needs. However, research specifically investigating the relationship between critical thinking disposition and self-efficacy among prospective teachers, particularly in Indonesia, remains limited.

Based on this background, this study aims to: (1) examine the direct and indirect relationships between self-efficacy and critical thinking disposition among prospective teachers in Indonesia, and (2) identify the critical thinking sub-factors most influenced by self-efficacy. Using a Structural Equation Modeling (SEM) approach, this study is expected to contribute both theoretically and practically to the development of teacher training strategies that support the improvement of future teaching quality.

2. Method

a. Research Method

A non-experimental quantitative approach with a correlational design was employed in this study, as it aligns with the research objective, namely to identify the relationship between self-efficacy and critical thinking disposition without manipulating the variables. This approach enables the researcher to empirically test a theoretical model by analyzing the relationships among variables (Creswell, 2014; Chang et al., 2022; Omar & Zoube, 2024). By employing the framework of correlational research model, the research aim is to construct a structural equation modeling encompassing observable and latent variables to investigate predictive

relationships. The Structural Equation Modeling (SEM) method was used as the analytical technique because it is capable of capturing both direct and indirect relationships between observed and latent variables simultaneously. SEM was chosen for its advantages in testing theoretical models holistically, including construct validity and the predictive strength among variables. A graphical representation of the structural equation model corresponding to the research hypotheses can be found in Figure 1.

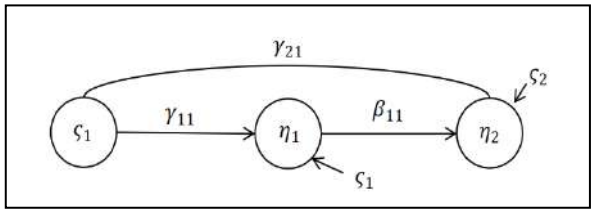

Figure 1. Structure Equation Modeling

The graphical depiction of the structural equation model based on the research hypotheses is provided in Figure 2. In figure 2, various observed variables and the relationships among them are represented through arrows and nodes. This model is used to test the hypotheses proposed in the study regarding the relationships between specific variables. Through this graphical representation, researchers can clearly visualize the structure of relationships among the variables in the model and how they are interconnected. This aids in understanding the theoretical framework underpinning the research and illustrates how the variables under investigation are expected to interact with each other.

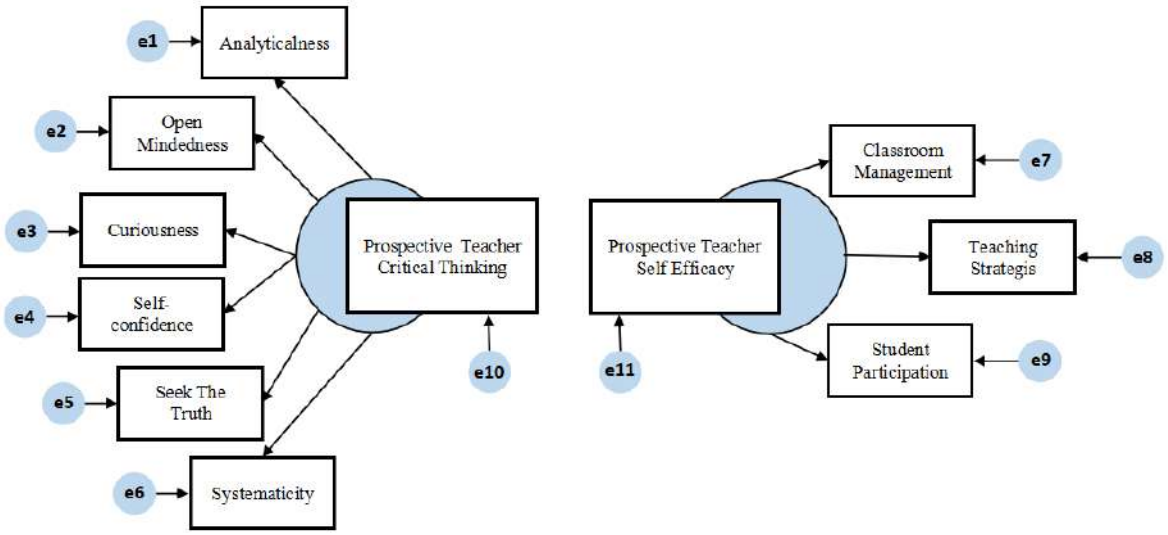

Figure 2. Graphical Representation of Pro-spective Teachers' Self-Efficacy Levels and the Relationship Between Critical Thinking Trend

b. Participants

426 prospective teacher students participated as respondents (43.4% (185) were male and 56.6% (242) were female), studying at 8 universities across Indonesia and hailing from various cities in 6 provinces: West Sumatra, Jambi, North Sumatra, Riau, Yogyakarta, and Lampung. The distribution percentage of respondents is as follows: 20.2% originated from universities in West Sumatra (SB), 24.7% from universities in Jambi (JA), 16.7% from universities in North Sumatra (SU), 14.6% from universities in Riau (RI), 17.9% from universities in Yogyakarta (YO), and 5.9% from universities in Lampung (LA).

Respondents were selected purposively, considering their participation in the Teacher Professional Education (PPG) program.

c. Data Collection Tool

The instruments used in this study consisted of two main scales: the California Critical Thinking Tendency Scale (CCTT) and the Teacher Self-Efficacy Scale (TSES). Data were collected through the distribution of online questionnaires. Once the data were gathered, quality checks were conducted using SPSS, including outlier detection through Mahalanobis distance analysis. Subsequently, both the measurement model and the structural model were tested using SEM with goodness-of-fit indicators such as RMSEA, CFI, TLI, and chi-square/df. These fit indices were used to evaluate the extent to which the proposed model corresponded with the empirical data. The measurement model employed in this research can be observed in the following Figure 3.

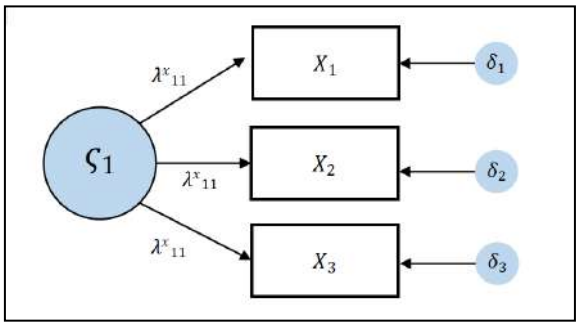

Figure 3. Measurement Model

This study employed the California Critical Thinking Tendency Scale (CCTT) as the instrument to measure critical thinking disposition. Originally developed by the American Philosophical Association, the instrument was later adapted into Indonesian by the researchers. The adaptation of this instrument was then tested for its validity and reliability. The CCTT scale consists of 7 theoretically predetermined and psychometrically tested subscales.

Although the internal consistency coefficient (alpha) of the CCTT subscales ranged from 0.60 to 0.78, the internal consistency coefficient of the entire scale reached 0.90 (Peter, 1990; Bycio & Allen, 2009; Gürsan et al., 2022). Furthermore, through the correlation of total item scores and principal component analysis, the number of items in this scale was successfully reduced from 75 to 49, with the original 7 factors reduced to 6 factors. Despite the internal consistency coefficient (alpha) for sub-factors of the CCTT scale ranging from 0.624 to 0.792, the internal consistency coefficient of the scale as a whole reached 0.864. Analysis indicated that this scale was able to explain 33.23% of the total variance. The goodness-of-fit indices for the proposed six-factor measurement model of critical thinking disposition are also presented in Table 1.

d. Critical Thinking Instrumen (CTI)

Table 1. Fit Index Values for the CTI

Fit Indices	Structural Equation Modeling	Perfect Fit	Acceptable Fit	Results
$X^2(df)$	40,57/(9)=4,51	$0 \leq X^2 \leq 3$	$3 < X^2 \leq 5$	Acceptable Fit
RMSEA	.074	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$	Acceptable Fit
TLI/NNFI	.97	$.97 \leq TLI \leq 1.00$	$.95 \leq TLI < .97$	Perfect Fit
CFI	.98	$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$	Perfect Fit
NFI	.98	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI < .95$	Perfect Fit
AGFI	,95	$.90 \leq AGFI \leq 1.00$	$.86 \leq AGFI < .90$	Perfect Fit
GFI	,98	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$	Perfect Fit

Based on Table 1, the analysis results of the first-order six-factor measurement model related to the critical thinking tendencies of pre-service teachers indicate a goodness-of-fit index value of 4.51. This value suggests that the model exhibits an acceptable level of fit (Goretzko et al., 2024; Toprak & Karakus, 2018). Although the obtained value is below 5, previous research has demonstrated that fit indices below this threshold can still be deemed acceptable in specific cases, particularly when there are strong theoretical justifications (Omar & Zoube, 2024; Sathyanarayana & Thangamuthu, 2024).

Furthermore, the Root Mean Square Error of Approximation (RMSEA) index of the model was found to be 0.074, indicating an acceptable model fit (Schermelleh-Engel et al., 2003). According to (Hu L.T. & M., 1999), an RMSEA value below 0.08 signifies a well-fitting model with empirical data. Additionally, when evaluating other goodness-of-fit indices such as the Tucker-Lewis Index/Non-Normed Fit Index (TLI/NNFI), Comparative Fit Index (CFI), Normed Fit Index (NFI), Adjusted Goodness-of-Fit Index (AGFI), and Goodness-of-Fit Index (GFI), it was found that all these indicators demonstrated an excellent model fit (Schermelleh-Engel et al., 2003). These values collectively indicate that the model aligns well with the observed empirical data.

The data gathered from respondents generally support the verification of the measurement model based on the critical thinking scale (Hooper et al., 2008). This confirms that the model provides a robust representation of pre-service teachers' critical thinking tendencies in accordance with the observed data. In conclusion, the analysis results suggest that the first-order six-factor measurement model for assessing pre-service teachers' critical thinking tendencies exhibits an acceptable level of fit across multiple fit indices. Although some indices are at the threshold of acceptability, the overall findings support the model as a valid representation of the observed phenomenon (Hooper et al., 2008; Hu L.T. & M., 1999; Schermelleh-Engel et al., 2003).

e. Self-efficacy Scale

In this study, data collection regarding the self-efficacy of pre-service teachers was conducted using the "Teacher Self-Efficacy Scale" developed by (Tschannen-Moran & Hoy, 2001). This scale was adapted into Indonesian by the researchers and underwent validity and reliability testing.

The scale consists of 24 items measured using a 9-point Likert scale. It was further divided into three sub-factors, each comprising 8 items: "Self-Efficacy for Student Engagement," "Self-Efficacy for Instructional Strategies," and "Self-Efficacy for Classroom Management" (Montoya, 2018; Scholarworks et al., 2020). Table 2 presents the goodness-of-fit index values for the three-factor measurement model of the teacher self-efficacy scale. These values indicate how well the measurement model aligns with the observed data. In the confirmatory factor analysis, the examined fit indices included the Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999).

Table 2. Fit Index Values for the Self-efficacy Scale

Fit Indices	Structural Equation Modeling	Perfect Fit	Acceptable Fit	Results
$X^2(df)$	40,57/(9)=4,51	$0 \leq X^2 \leq 3$	$3 < X^2 \leq 5$	Acceptable Fit
RMSEA	.078	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$	Acceptable Fit
TLI/NNFI	.98	$.97 \leq TLI \leq 1.00$	$.95 \leq TLI < .97$	Perfect Fit
CFI	.97	$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$	Perfect Fit
NFI	.97	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI < .95$	Perfect Fit
AGFI	,96	$.90 \leq AGFI \leq 1.00$	$.86 \leq AGFI < .90$	Perfect Fit
GFI	,98	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$	Perfect Fit

Analyzing the Table-2, it's evident that the compliance index values of the 1st Level 3-factor measurement model established regarding the teacher self-efficacy levels of the Prospective teacher indicate a good fit. The χ2 / (df) value is calculated as 4.79, which is below the threshold of 5, indicating an acceptable fit index. It's worth noting that while the χ2 statistic is sensitive to sample size and may result in rejecting well-fitting models, other fit indices provide more robust

collected from Prospective teachers overall indicate that the measurement model established on the teacher self-efficacy scale is validated, as evidenced by the fit index values. Despite some indices being close to the cutoff values, the overall pattern suggests a robust fit of the model to the data (Hooper et al., 2008; Hu L.T. & M., 1999; Montoya, 2018; Scholarworks et al., 2020; Tschannen-Moran & Hoy, 2001)

f. Data Analysis

The data processing conducted using the SPSS statistical program is a crucial initial step in this study to examine measurement errors and ensure data quality (Rahman & Muktadir, 2021). Research involving structural equation modeling (SEM) analysis often requires the examination of Mahalanobis distance to detect extreme or inappropriate data (Tabachnick & Fidell, 2019). This examination aims to ensure that the data used in the analysis are not affected by outliers that may significantly influence evaluations. Furthermore, examining the RMSEA fit index reveals a value of 0.077, which also falls within the acceptable. As described by (Hu L.T. & M., 1999), an RMSEA value below 0.08 suggests a good fit of the model to the data. Moreover, when TLI / NNFI, CFI, NFI, AGFI, and GFI values are scrutinized, all demonstrate a perfect fit index value. These indices collectively affirm the model's excellent fit with the observed data. In summary, the data the results. Subsequently, structural equation modeling analysis is performed using processed and quality-verified data. In this context, the evaluation criteria established by (Schermelleh-Engel et al., 2003) are employed to assess model fit indices. This evaluation includes testing the fit of both the measurement model and the structural model, which is a critical step in validating research hypotheses and gaining a deeper understanding of the relationships between variables. Thus, the steps taken in this data analysis align with best practices in structural equation modeling research. The use of evaluation criteria established by previous researchers also helps ensure the integrity of the analysis and the interpretation of results (Tabri & Elliott, 2016).

3. Result and Discussion

The results of data analysis using Structural Equation Modeling (SEM) indicated that all path relationships in the

model were statistically significant at the 0.01 level, demonstrating that the relationships among variables in this model are statistically meaningful. The structural paths are presented as follows in Figure 4.

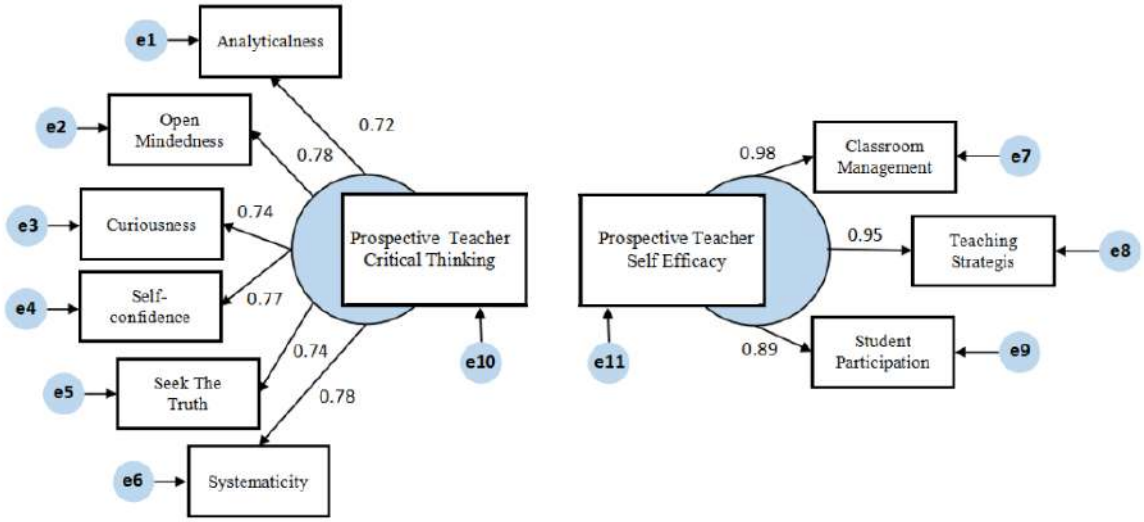

Figure 4. Structural Equation Model for the Relationship between Prospective Teachers' Self-efficacy Levels and Critical Thinking Skills

Figure 4 presents the analysis results, indicating that the p-values representing the significance levels of the t-statistics for all paths in the structural equation model are significant at the 0.01 level. This implies that all the paths constructed within the model are statistically significant. The model fit indices associated with the structural equation model, developed using data from prospective teachers, are presented in Table 3.

Table 3. Fit Index Values for the Critical Thinking Test Instrumen (CTTI).

Fit Indices	Structural Equation Modeling	Perfect Fit	Acceptable Fit	Results
$X^2(df)$	40,57/(9)=4,51	$0 \leq X^2 \leq 3$	$3 < X^2 \leq 5$	Acceptable Fit
RMSEA	.078	$0 \leq RMSEA \leq .05$	$.05 < RMSEA \leq .08$	Acceptable Fit
TLI/NNFI	.98	$.97 \leq TLI \leq 1.00$	$.95 \leq TLI < .97$	Perfect Fit
CFI	.97	$.97 \leq CFI \leq 1.00$	$.95 \leq CFI < .97$	Perfect Fit
NFI	.98	$.95 \leq NFI \leq 1.00$	$.90 \leq NFI < .95$	Perfect Fit
AGFI	,96	$.90 \leq AGFI \leq 1.00$	$.86 \leq AGFI < .90$	Perfect Fit
GFI	,97	$.95 \leq GFI \leq 1.00$	$.90 \leq GFI < .95$	Perfect Fit

Based on the χ^2/df value, it was found that this value is 3.38, which is considered an acceptable fit index as it is less than 5. Furthermore, the RMSEA fit index was also found to be within the acceptable range, with a value of 0.061. Additionally, when examining the values of TLI/NNFI, CFI, NFI, AGFI, and GFI, it was determined that the model exhibits a perfect fit index. This analysis indicates that the structural equation model constructed using data from prospective teachers is generally confirmed.

These findings suggest that the structural equation model is both empirically and

statistically significant, providing a solid foundation for interpreting the relationship between self-efficacy and the tendency for critical thinking among prospective mathematics teachers. This is consistent with previous research highlighting the importance of the relationship between teacher self-efficacy and students' critical thinking abilities (Amirian et al., 2023; Paisun et al., 2024; Savaş et al., 2014). Thus, the results of this analysis make a significant contribution to deepening the understanding of factors influencing critical thinking tendencies in prospective teachers. Furthermore, they provide a strong empirical basis for developing more effective educational intervention strategies.

The results related to the structural equation model can be found in Table-4. Previous studies have also highlighted the importance of fit indices in testing the validity of structural equation models. For instance, Byrne (2013) explained that a χ^2/df value of less than 5 indicates a good model fit with the data. Similarly, (Schermelleh-Engel et al., 2003) emphasized the importance of using multiple fit indices, such as TLI, CFI, and NFI, to ensure model validity.

Thus, the findings from this analysis demonstrate that the structural equation model developed using data from prospective teachers has an acceptable fit, providing a strong foundation for interpreting the relationships between the variables examined in the model. This is crucial in the context of mathematics education research to ensure that theoretically developed models align with existing empirical data.

Table 4. Paths to the Variables Related to the Structural Equation Modeling Established

Variables	Prospective Teachers' Self-efficacy		
	Direct Effect	Indirect Effect	Total Effect
Critical Thinking Tendency	-	.349	.349
Analyticalness	-	.335	.335
Open-mindedness	-	.349	.349
Curiousness	-	.323	.323
Self-confidence	-	.335	.335
Seek to truth	-	.349	.349
Systematicity	-	.311	.311

The analysis in Table-4 reveals that the direct effect of prospective teachers' self-efficacy on their tendency for critical thinking is calculated at 0.44. Since prospective teachers' self-efficacy does not have an indirect effect on their critical thinking tendency, the total effect accounts for 44%. It was found that self-efficacy does not have a direct effect on the sub-factors of the critical thinking disposition scale but does exert an indirect effect on the overall scale.

When these indirect effects were analyzed, the indirect effect of prospective teachers' self-efficacy on the analytical sub-factor was 0.35, on the open-minded thinking sub-factor was 0.35, on curiosity was 0.33, on confidence was 0.33, on truth-seeking was 0.33, and on systematic thinking was 0.28. It was observed that the sub-factor most strongly influenced indirectly by prospective teachers' self-efficacy was analytical thinking, while the least influenced sub-factor was systematic thinking. These findings highlight the importance of understanding how prospective teachers'

self-efficacy influences different aspects of their critical thinking tendency. Previous research has shown that teacher self-efficacy can affect various cognitive and psychological aspects of students, including their tendency for critical thinking (Achurra & Villardón, 2012; Fernandez et al., 2016; Goretzko et al., 2024; Omar & Zoube, 2024; Savaş et al., 2014; Shroff et al., 2019). Furthermore, these results suggest that the influence of prospective teachers' self-efficacy on critical thinking may be more focused on analytical aspects rather than other dimensions, emphasizing the need to consider variability in self-efficacy effects across different components of critical thinking disposition (Listiaji et al., 2022).

The research findings indicate that the structural equation model linking prospective teachers' self-efficacy with critical thinking skills exhibits strong statistical significance at the 0.01 level. Model fit indices, such as the χ^2/df value of 3.38 and the RMSEA value of 0.061, suggest that the model has an acceptable fit with the collected data. Additionally, other fit indices, including TLI, CFI, and NFI, indicate that the model demonstrates good validity (Hooper et al., 2008; Hu L.T. & M., 1999; Tabri & Elliott, 2016). Prospective teachers' self-efficacy has a direct effect of 0.44 on their critical thinking tendency; however, it does not directly affect specific sub-factors of the critical thinking disposition scale. Instead, the indirect effects of self-efficacy are more pronounced in the analytical (0.35) and open-minded thinking (0.35) sub-factors, while the least influenced sub-factor is systematic thinking (0.28). This suggests that self-efficacy plays a more significant role in analytical and open-minded aspects of critical thinking compared to other dimensions (Gonzalez & Maxwell, 2018; Meera & Jumana, 2015; Saepuloh et al., 2021; Siregar & Prabawanto, 2021; Straessle, 2014; Zimmerman, 1990).

These findings align with research conducted by (Dehghani et al., 2011; Shaikh & Chandio, 2024; Yulianto et al., 2024), which emphasizes that an individual's self-efficacy is significantly related to critical thinking ability and academic performance. Furthermore, (Bandura, 1978; Nabavi, 2014) highlighted that high self-efficacy contributes to an individual's capacity to tackle complex cognitive challenges, including critical thinking. Additionally, (Facione, 2011; Merma-Molina et al., 2022) revealed that critical thinking comprises multiple aspects, including analytical and open-minded thinking, which can be influenced by a person's level of self-confidence. Moreover, research by (Manitzas Hill et al., 2022; Nurulwati* et al., 2022; Tang et al., 2022) demonstrated that individuals with higher self-efficacy tend to be more confident in assessing and evaluating information critically. Therefore, the findings of this study reinforce the notion that self-efficacy plays a significant role in shaping the critical thinking tendencies of prospective teachers.

Based on a comparison of the findings of this study with previous research, it can be assumed that prospective teachers' self-efficacy is a fundamental factor in developing their critical thinking skills, particularly in the aspects of analytical and open-minded thinking. This assumption is reinforced by the study of (Babaei & Abednia, 2016; Harahap & Fithriani, 2024), which stated that individuals with high self-efficacy are more likely to engage in reflective thinking and conduct in-depth analyses of problems. Additionally, the study conducted by (Orakcı & Khalili, 2024; Şirin, 2021) supports this view by showing that individuals with high self-efficacy are more

open to cognitive challenges and exhibit greater flexibility in thinking. Meanwhile, research by (Bezanilla et al., 2021; Raković et al., 2022; Runisah et al., 2017) argues that critical thinking is influenced not only by cognitive factors but also by motivational and affective factors, including self-efficacy. Therefore, this study provides significant contributions to understanding the role of self-efficacy in shaping critical thinking tendencies and offers a foundation for developing more effective educational strategies to enhance prospective teachers' competence in critical thinking.

The implications of these findings emphasize that teacher training programs should focus on strengthening self-efficacy to improve their critical thinking skills. This aligns with the findings of (Omar & Zoube, 2024; Toprak & Karakus, 2018), who stated that teachers with high self-efficacy tend to be more effective in managing classrooms and encouraging students to think critically. Moreover, a study by (Lin et al., 2020; Luther, 2022; X. Shi, 2024) showed that high self-efficacy can enhance cognitive strategies and intrinsic motivation, ultimately improving an individual's critical thinking ability. Furthermore, research by (Cassidy, 2015) also demonstrated that high self-efficacy increases individuals' resilience in facing academic challenges, including in developing critical thinking. Therefore, strengthening self-efficacy through various intervention strategies, such as metacognitive skills training and problem-based learning approaches, can be an effective step in improving prospective teachers' critical thinking skills. Overall, this study provides valuable insights into the relationship between self-efficacy and critical thinking skills in prospective teachers.

These findings not only align with previous research but also reinforce the assumption that self-efficacy plays a crucial role in shaping an individual's critical thinking ability. With support from various prior studies, this research offers a strong foundation for developing more effective educational policies aimed at enhancing prospective teachers' self-efficacy to support the development of their critical thinking skills (Rusiana et al., 2024). Therefore, the development of educational strategies that can improve prospective teachers' self-efficacy should be a primary focus in efforts to enhance the quality of learning in the future.

The practical implication of these findings is that teacher training programs should explicitly incorporate strategies to strengthen self-efficacy, particularly through reflective training, problem-solving simulations, and project-based learning. Since self-efficacy was found to have the strongest influence on analytical thinking and open-mindedness, training programs that specifically foster these two aspects may serve as effective strategies for enhancing the critical thinking quality of prospective teachers.

4. Conclusion

This study confirms that prospective teachers' self-efficacy significantly influences their disposition toward critical thinking, both directly and indirectly, particularly in the dimensions of analytical thinking and open-mindedness. These findings offer valuable contributions to the field of teacher education by highlighting that the development of professional self-confidence plays a central role in shaping critical thinking abilities essential for reflective teaching. Consequently, teacher education programs should systematically integrate self-efficacy enhancement

strategies—such as reflection-based training, peer mentoring, and problem-based learning—to equip prospective teachers with the cognitive and affective skills required in 21st-century education. Nevertheless, this study is limited in terms of its geographical scope and its focus on teacher professional education programs. Therefore, future research is recommended to involve broader samples and explore additional factors that may mediate or moderate the relationship between self-efficacy and critical thinking skills, in order to deepen the understanding and application of teacher education practices.

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