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Integration of Artificial Intelligence in Microteaching and it's Impact on Self-Confidence and Anxiety in Teaching Students

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ABSTRACT

In this study, the integration of AI in microteaching was operationalized through the use of AI-based technologies in lesson planning, instructional material development, teaching practice simulations, and automated feedback provision. However, mathematics education students still face psychological challenges, particularly related to self-confidence and teaching anxiety during teaching practice. This study aimed to analyze the relationship between AI integration in microteaching and the teaching self-confidence and teaching anxiety of mathematics education students. The research employed a quantitative approach with an ex post facto design and involved 103 students from the Mathematics Education Study Program at UIN Raden Intan Lampung as respondents. Data were collected through questionnaires and analyzed using statistical software through two separate simple linear regression models, namely to examine the relationship between AI integration (X) and teaching self-confidence (Y_1), and between AI integration (X) and teaching anxiety (Y_2). The results showed that AI integration had a positive and significant relationship with teaching self-confidence, with a coefficient of determination of $R^2 = 0.414$. In contrast, AI integration demonstrated a negative and significant relationship with teaching anxiety, with a coefficient of determination of $R^2 = 0.088$. The novelty of this study lies in its examination of AI integration in microteaching by simultaneously investigating the aspects of teaching self-confidence and teaching anxiety among prospective mathematics teachers. The findings imply that the utilization of AI in microteaching can support the pedagogical and psychological readiness of prospective teachers in the context of 21st-century education.

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Introduction

Transformasi The digital transformation of the 21st century has brought significant changes to various aspects of life, including the field of education (Dede, 2010). One technological advancement that is increasingly being utilized in the learning process is Artificial Intelligence (AI), which can support learning by providing more adaptive and interactive instructional materials as well as automated feedback tailored to users' needs. In teacher education, the use of AI has begun to be integrated into microteaching activities as a teaching practice medium that enables student teachers to develop their pedagogical competencies before engaging in actual classroom situations (Kauchak, D., & Eggen, 2017). Microteaching plays a strategic role because it not only trains students' abilities to design, deliver, and evaluate instruction, but also serves as an initial environment in which they encounter various psychological dynamics that arise during teaching practice (Prensky, 2010). For mathematics education students, microteaching constitutes a particularly important stage because the delivery of mathematical concepts requires strong content mastery, effective communication skills, and psychological readiness when interacting in front of a class (Mulyasa, 2013). However, in practice, many students continue to experience psychological challenges, such as a lack of self-confidence when explaining learning materials, hesitation in responding to questions, and feelings of anxiety when performing teaching activities in front of lecturers and peers. These conditions may adversely affect the quality of teaching practice and students' readiness to become professional educators. Therefore, investigating the integration of AI into microteaching activities is important for understanding its relationship with students' psychological aspects, particularly teaching self-confidence and teaching anxiety (OECD., 2021).

Previous studies have shown that the use of Artificial Intelligence (AI) in education is not only associated with improving the quality of learning but also has the potential to influence students' psychological readiness in dealing with academic tasks. Studies conducted by Holmes et al.,(2020) and Seters (2020) explain that AI can provide more adaptive learning experiences through the analysis of learners' needs, personalized content delivery, and more interactive learning responses. One of the main advantages of AI lies in its ability to provide automated and continuous feedback, enabling learners to identify their strengths and weaknesses more quickly throughout the learning process. Holmes et al. (2020) further argue that AI has significant potential to create more personalized learning experiences. Findings by Viberg et al. (2020) and Chen & Chen (2020) indicate that consistently delivered feedback can strengthen self-efficacy, or an individual's belief in their ability to successfully accomplish learning tasks. According to Bandura (1997), self-efficacy influences how individuals think, feel, and act when facing a particular task. In the context of microteaching, the enhancement of self-efficacy is particularly important because this activity places students in simulated teaching situations that require content mastery, communication skills, and psychological readiness before entering actual classroom environments. Amobi (2005) emphasizes that microteaching functions not only as a means of developing pedagogical skills but also as a reflective space for prospective teachers to evaluate and improve their teaching performance. The integration of AI into microteaching activities has the potential to strengthen this reflective process through learning simulations and more structured automated feedback. On the other hand, Scherer et al. (2021) found that the use of technology in education is also associated with individuals' psychological conditions, particularly self-confidence and anxiety during academic performance. Horwitz et al. (1986) explain that academic anxiety can negatively affect an individual's performance when facing evaluative situations. Based on these findings, the integration of AI into microteaching

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warrants further investigation, particularly regarding its relationship with teaching self-confidence and teaching anxiety among mathematics education students.

A review of previous studies indicates that research on the use of Artificial Intelligence (AI) in education has primarily focused on learning effectiveness, content personalization, improvement of learning outcomes, and the development of pedagogical competencies. Several studies have also examined the use of AI to support reflection and evaluation processes in learning. However, there remains a limited body of research that specifically situates AI within the context of microteaching and investigates its relationship with the psychological aspects of prospective teachers, particularly teaching self-confidence and teaching anxiety among mathematics education students. According to (Seo et al. (2021) the integration of AI into online learning environments can enhance learning interactions and improve students' learning experiences. Darling-Hammond. & Hyler (2022) argue that educational technologies can help prospective teachers develop pedagogical readiness in a more flexible and effective manner. Nevertheless, most previous studies have tended to examine teaching self-confidence and teaching anxiety as separate constructs. Consequently, research that simultaneously investigates the relationship between AI integration and both teaching self-confidence and teaching anxiety within a single conceptual framework remains relatively limited. Based on this literature review, the present study contributes to the advancement of technology-enhanced microteaching research by examining the relationship between AI integration as a tool for teaching practice, reflection, and instructional feedback and the levels of teaching self-confidence and teaching anxiety among mathematics education students. This study seeks to provide a more comprehensive understanding of the pedagogical and psychological implications of AI integration in the preparation of prospective mathematics teachers.

Based on the discussion presented in the previous sections, this study aims to analyze the relationship between the integration of Artificial Intelligence (AI) in microteaching activities and the teaching self-confidence and teaching anxiety of mathematics education students. The study employs a quantitative approach with an ex post facto design and utilizes linear regression analysis to identify the relationships among the variables under investigation. Based on the proposed conceptual framework, the research hypotheses state that AI integration in microteaching is positively associated with teaching self-confidence and negatively associated with teaching anxiety among mathematics education students. This study is expected to contribute to the development of technology-enhanced learning by demonstrating how AI can support not only pedagogical competencies but also the psychological readiness of prospective teachers in the digital era. Teaching self-confidence is one of the psychological factors that plays a crucial role in determining the quality of teaching performance among prospective teachers. Drawing upon self-efficacy theory, Pajares (2001) argues that individuals' beliefs in their capabilities influence their thought patterns, motivation, and behavior when performing a task. In the educational context, research by Scherer suggests that technological support in learning environments is associated with the development of self-confidence through more personalized and adaptive learning experiences. Furthermore Viberg et al. (2020) found that AI-based technologies can assist students in reflecting on their learning performance through automated feedback, thereby enabling them to recognize the development of their competencies more objectively. On the other hand, teaching anxiety is another psychological aspect that frequently emerges during microteaching practice. Teaching anxiety is characterized by feelings of tension, concerns about making mistakes, fear of negative evaluation, and uncertainty when presenting and delivering instructional content in front of a class (Zimmerman, 2000). Mathematics education students often face more complex challenges because they are required not only to master pedagogical skills but also to explain abstract mathematical concepts clearly and systematically. Research conducted by Horwitz et al. (1986)

demonstrated that academic anxiety can negatively affect individual performance in evaluative and presentation-related situations, Similarly Scherer et al. (2021) reported that the use of technology in education is associated with more adaptive psychological conditions through flexible learning environments and constructive feedback mechanisms. Within the context of microteaching, Chen & Chen (2020) also found that AI-based technologies help students independently evaluate their teaching performance, providing opportunities for reflection, performance improvement, and more thorough preparation before engaging in actual classroom teaching. Therefore, the integration of AI into microteaching may serve as a valuable tool for enhancing both pedagogical competence and psychological readiness among prospective mathematics teachers, particularly by strengthening teaching self-confidence and reducing teaching anxiety.

Method

Research Method

This study employed a quantitative approach with an ex post facto research design to analyze the relationships among variables based on conditions that had naturally occurred, without any treatment, manipulation, or direct control of the research variable (Kerlinger & Lee, 2000). Through this design, the researcher examined the relationships and predictive contributions between the integration of Artificial Intelligence (AI) in microteaching activities and the teaching self-confidence and teaching anxiety of mathematics education students (Fraenkel et al., 2012). In this study, AI integration was operationalized as the use of AI-based technologies by students during lesson planning, instructional material development, teaching practice simulations, and the receipt of automated feedback throughout microteaching activities. Meanwhile, microteaching was defined as a teaching practice conducted in a controlled and limited environment designed to help students develop pedagogical skills, communication abilities, and psychological readiness before engaging in actual classroom teaching. By employing an ex post facto design, this study focused on analyzing the relationships and the extent of the contribution of AI integration to students' teaching self-confidence and teaching anxiety based on empirical data collected from real-world conditions in the field (Sugiyono., 2022). The design was considered appropriate because the variables under investigation had already occurred naturally and could not be manipulated by the researcher. Therefore, the study aimed to provide empirical evidence regarding the role of AI integration in supporting the pedagogical and psychological preparedness of prospective mathematics teachers.

Population and Samples

This study was conducted at UIN Raden Intan Lampung on February 20, 2026. The participants consisted of 103 students from the Mathematics Education Study Program who had completed microteaching activities and were selected as research respondents. Based on demographic characteristics, the respondents included 16 male students (15.5%) and 87 female students (84.5%). This composition indicates that female students constituted the majority of participants in the study compared to their male counterparts.

In addition to gender, the respondents were also described based on the psychological variables that constituted the focus of this study, namely teaching self-confidence and teaching anxiety. The results indicated that most students demonstrated a relatively high level of teaching self-confidence during their microteaching practice. This finding was supported by the

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regression analysis, which revealed that the integration of Artificial Intelligence (AI) in microteaching was positively and significantly associated with teaching self-confidence, accounting for 41.4% of the variance in students' teaching self-confidence ($R^2 = 0.414$). On the other hand, students' levels of teaching anxiety tended to be relatively low. The analysis further showed that AI integration was negatively and significantly associated with teaching anxiety, accounting for 8.8% of the variance in teaching anxiety ($R^2 = 0.088$). This finding suggests that the use of AI in microteaching was associated with lower levels of teaching anxiety during teaching practice activities.

Overall, these results indicate that AI integration in microteaching may contribute to the psychological readiness of pre-service mathematics teachers by enhancing teaching self-confidence while reducing teaching anxiety. Overall, the respondent characteristics suggest that the participating pre-service mathematics teachers possessed relatively positive psychological readiness for microteaching practice and demonstrated adaptability to the use of Artificial Intelligence (AI)-based technologies in teaching and learning activities. Participants were selected using a purposive sampling technique, which involves selecting individuals based on specific criteria aligned with the research objectives. The inclusion criterion required participants to have completed microteaching activities. This criterion ensured that the respondents had sufficient experience to provide relevant information regarding AI integration in microteaching, teaching self-confidence, and teaching anxiety.

Instruments

A questionnaire was used as the primary instrument for data collection in this study. The questionnaire was designed to measure three research variables: Artificial Intelligence (AI) integration as the independent variable (X), teaching self-confidence as the first dependent variable (Y_1), and teaching anxiety as the second dependent variable (Y_2) within the context of microteaching activities. The instrument was developed to capture students' perceptions, experiences, attitudes, and responses regarding the use of AI during teaching practice. Operationally, AI integration was defined as the extent to which students utilized AI-based technologies to support microteaching activities. This included the use of AI for preparing instructional materials, developing lesson plans and teaching resources, conducting teaching simulations, and receiving automated feedback throughout the teaching practice process. Teaching self-confidence was measured through students' beliefs in their ability to deliver instructional content effectively, speak confidently in front of a class, interact with learners, and demonstrate readiness to become future teachers. Meanwhile, teaching anxiety was assessed through students' emotional responses, including feelings of nervousness, tension, fear of making mistakes, concerns about being negatively evaluated by others, and levels of comfort when speaking in front of a class during microteaching activities.

The questionnaire employed a five-point Likert scale consisting of: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. This scale was selected because it allows respondents' levels of agreement with each statement to be measured in greater detail. The questionnaire items were constructed in both positive and negative forms to obtain a more objective representation of the respondents' conditions and perceptions. The content validity of the instrument was evaluated through expert judgment involving specialists in education, educational technology, and microteaching. The experts assessed the alignment of each item with the corresponding variable indicators, the clarity of wording, and the relevance of the items to the research context. The results of the expert evaluations were subsequently analyzed using a content validity coefficient, namely Aiken's V. In addition, the reliability of the instrument was assessed using Cronbach's alpha coefficient. An instrument was considered reliable if it

achieved a Cronbach's alpha value of at least 0.70, indicating that the items demonstrated adequate internal consistency and were suitable for use in the subsequent statistical analyses.

Table 1. Instrument Indicators and Questionnaire Item

Variable	Indicator	Statement
AI Integration (X)	Utilization of AI in teaching preparation	AI helps me prepare materials for *microteaching*.
	Utilization of AI in learning preparation	AI helps me develop instructional strategies
	Utilization of AI in learning reflection	AI helps me evaluate teaching performance
	Utilization of AI in feedback	AI provides feedback on my teaching practice
Self-confidence in teaching (Y_1)	Confidence in teaching ability	I am confident in my ability to become a teacher in the future
	Confidence in speaking in front of a class	I feel confident when presenting learning materials in front of a class
	Confidence in answering questions	I am able to answer questions during teaching activities
	Readiness to manage learning activities	I feel prepared to manage a classroom effectively
Teaching anxiety (Y_2)	Nervousness during teaching	I feel nervous when conducting *microteaching* activities.
	Afraid of making a mistake	I am afraid of making mistakes while teaching
	Anxious about the judgment	I feel anxious when being evaluated by lecturers or peers
	Tension before teaching	I feel tense before starting a teaching practice session
	Concern about explaining instructional content	I worry that I may not explain the learning material effectively
	Comfort in speaking in front of a class	I feel uncomfortable when speaking in front of a class
	Physical reactions during teaching	My heart beats faster when I am about to begin a *microteaching* session
	Concern about audience understanding	I am concerned that other students may not understand my explanation
	AI and anxiety management	AI helps reduce my anxiety during teaching activities
	AI and teaching calmness	feel more relaxed after preparing teaching materials with the assistance of AI.

The validity test was conducted to determine the extent to which the instrument accurately measured the research variables. Experts with expertise in education and research instrumentation were invited to evaluate the appropriateness of the questionnaire items in terms of content, language, and alignment with the designated indicators. Based on the experts' feedback, several questionnaire items were revised to improve the quality and suitability of the instrument for data collection. In addition to validity testing, a reliability test was conducted to assess the internal consistency of the instrument. Reliability was evaluated using Cronbach's alpha coefficient. An instrument was considered reliable when the Cronbach's alpha value exceeded 0.70, indicating an acceptable level of internal consistency and supporting the use of the questionnaire as a reliable tool for data collection (Hair et al., 2019).

Data Collection

This study was conducted through several systematic stages to ensure that the data collection process was well organized and aligned with the research objectives. In the initial

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stage, the researcher identified the research problem through a review of the relevant literature and observations of microteaching practices among Mathematics Education students. Based on the findings from this preliminary investigation, the research variables were determined, and a questionnaire based on a five-point Likert scale was developed, with response options ranging from 1 to 5. The research instrument was designed to measure three main variables: AI integration in microteaching (X), teaching self-efficacy (Y_1), and teaching anxiety (Y_2). The AI integration variable was developed based on indicators related to the use of technology during the planning, implementation, and evaluation stages of instruction. Teaching self-efficacy was measured through indicators such as confidence in one's teaching abilities, mastery of subject matter, and classroom management skills. Meanwhile, teaching anxiety was assessed through indicators related to nervousness, fear, and tension experienced during teaching activities. Prior to the main data collection process, the quality of the instrument was evaluated through validity and reliability testing to ensure that each questionnaire item consistently and accurately measured the intended constructs. After the instrument was confirmed to be valid and reliable, the questionnaire was distributed to 103 students from the Mathematics Education Study Program who had completed microteaching activities and met the established criteria for participation in the study.

The collected data were then coded, tabulated, and prepared for statistical analysis to examine the relationships between AI integration in microteaching, teaching self-efficacy, and teaching anxiety among the participants. Subsequently, the collected data were coded, tabulated, and analyzed using statistical software. Prior to hypothesis testing, several assumptions of regression analysis were examined, including normality, linearity, and heteroscedasticity tests. After the assumptions were satisfied, simple linear regression analysis was conducted to investigate the relationship between AI integration in microteaching and the two dependent variables, namely teaching self-efficacy and teaching anxiety. Finally, the results were interpreted, and conclusions were drawn based on the empirical findings of the study (Suharsimi, 2019).

Analysis

The data obtained from the questionnaire were analyzed using statistical software to provide empirical evidence regarding the relationships among the research variables. The analysis was conducted in several stages, beginning with descriptive statistical analysis to summarize the characteristics of the data for each variable. The descriptive statistics included the mean, minimum score, maximum score, and standard deviation for AI integration (X), teaching self-efficacy (Y_1), and teaching anxiety (Y_2).

The next stage involved conducting prerequisite tests to ensure that the data met the assumptions required for regression analysis. These tests included normality, linearity, and heteroscedasticity tests. The normality test was performed using the Kolmogorov–Smirnov method to examine the distribution of the residuals. The data were considered normally distributed when the significance value exceeded 0.05. Subsequently, a linearity test was conducted to determine whether a linear relationship existed between AI integration and each dependent variable. The assessment was based on the Deviation from Linearity statistic, with a significance value greater than 0.05 indicating a linear relationship. In addition, a heteroscedasticity test was performed using the Glejser method to determine whether the variance of the residuals remained constant across observations. The regression model was considered free from heteroscedasticity when the significance value was greater than 0.05.

After all assumptions had been satisfied, the analysis proceeded using two separate simple linear regression models. The first model was employed to examine the relationship between

AI integration (X) and teaching self-efficacy (Y_1), whereas the second model was used to investigate the relationship between AI integration (X) and teaching anxiety (Y_2). Hypothesis testing for each regression model was conducted using the t-test (partial test) to determine the significance of the relationship between the independent variable and the dependent variable. The hypothesis was accepted when the significance value was less than 0.05. In addition, the coefficient of determination (R^2) was calculated to assess the extent to which AI integration explained the variance in teaching self-efficacy and teaching anxiety. A higher R^2 value indicates a greater proportion of variance in the dependent variable that is accounted for by the independent variable within the proposed regression model. Through these analytical procedures, the study sought to provide empirical evidence regarding the relationships between the integration of Artificial Intelligence in microteaching activities and the levels of teaching self-efficacy and teaching anxiety among pre-service mathematics teachers.

Research Findings

Descriptive Statistics of the Research Data

Descriptive statistical analysis was conducted to provide a general overview of the research data collected from 103 respondents. The descriptive analysis included the minimum value, maximum value, mean, and standard deviation for each research variable, namely AI integration in microteaching, teaching self-efficacy, and teaching anxiety.

The results indicated that the AI integration variable exhibited a relatively high mean score. This finding suggests that the respondents demonstrated positive perceptions regarding the use of AI in microteaching activities. Furthermore, the teaching self-efficacy variable also showed a high mean score, indicating that the use of AI may support students in developing greater confidence in their teaching abilities during teaching practice.

In contrast, the teaching anxiety variable showed a lower mean score compared to the other variables. This result suggests that the use of AI may help reduce students' anxiety when conducting teaching activities in front of a class. The standard deviation values for each variable indicate the presence of variation in respondents' perceptions and experiences regarding the use of AI in microteaching activities.

Table 2. Descriptive Statistics of the Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Artificial Intelligence Integration in Microteaching (X)	103	24	50	41,27	4,321
Teaching Self-Confidence (Y_1)	103	20	45	36,85	3,978
Teaching Anxiety (Y_2)	103	15	42	28,14	5,102

Based on Table 2, the variable of Artificial Intelligence (AI) integration in microteaching obtained a mean score of 41.27 with a standard deviation of 4.321. The teaching self-confidence variable obtained a mean score of 36.85 with a standard deviation of 3.978. Meanwhile, the teaching anxiety variable obtained a mean score of 28.14 with a standard deviation of 5.102. These findings indicate that the use of AI in microteaching activities tends to have a positive effect on enhancing students' teaching self-confidence while also helping to reduce their levels of teaching anxiety.

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Validity

The validity test was conducted to determine how well each questionnaire item accurately measures the intended variable. The validity test was conducted using the Pearson Product-Moment correlation between the score of each item and the total score (n =103, r_{table} = 0,195). An instrument item was considered valid if the obtained correlation coefficient ($r_{calculated}$) was equal to or greater than the critical value (r_{table}), or if the two-tailed significance value was less than or equal to 0.05. Conversely, if r_{hitung} was lower than r_{table} or the significance value exceeded 0.05, the item was considered invalid. The validity test results for each research variable are presented in Table 3.

Table 3. Validity Test Result

Variable	$r_{calculated}$
X	0,775-0,853
Y_1	0,719-0,882
Y_2	0.424-0,935

Based on Table 3, it is evident that all items within the variables of Artificial Intelligence Integration in Microteaching (X), Students' Teaching Self-Confidence (Y_1), and Students' Teaching Anxiety (Y_2) have correlation coefficients ($r_{calculated}$) higher than the critical value (r_{table}), with significance levels below 0.05. Therefore, all questionnaire items were considered valid.

Reliability

The reliability test in this study was conducted on 29 questionnaire items measuring the variables of Artificial Intelligence Integration in Microteaching (X), Teaching Self-Confidence (Y_1), and Teaching Anxiety (Y_2). Reliability was assessed using Cronbach's Alpha coefficient through SPSS version 25. An instrument is considered reliable when its Cronbach's Alpha coefficient exceeds 0.60, indicating an adequate level of internal consistency. A higher alpha value reflects greater reliability and consistency of the instrument. The results of the reliability test are presented in Table 4.

Table 4. Reability Test

Variable	Number of Items	Cronbach's Alpha (α)
X	9	0,944
Y_1	10	0,947
Y_2	10	0,925

Referring to Table 4, it can be concluded that all variables exceeded the minimum criterion of 0.60. Therefore, the research instrument demonstrated a high level of internal consistency and was deemed suitable for use in further analyses.

Results of the Assumption Tests

Normality

Data normality was assessed using the One-Sample Kolmogorov–Smirnov test in SPSS version 25. A dataset was considered to be normally distributed when the Asymp. Sig. (2-tailed) value was greater than 0.05. The results of the normality analysis are presented in Table 5.

Table 5. Normality Test Results

Variable	Sig.
X, Y_1, Y_2	<0,05
Residual Y_1 & Y_2	<0,05

Based on Table 5, each variable exhibited an Asymp. Sig. value of less than 0.05, indicating that the data did not meet the assumption of normal distribution. However, the study could still proceed because the sample size exceeded 30 (N = 103), satisfying the requirements of the Central Limit Theorem. Therefore, the regression analysis was considered sufficiently robust despite the violation of the normality assumption. The analysis was subsequently continued with other assumption tests, including tests of linearity, heteroscedasticity, and multicollinearity.

Linearity

The linearity test was performed to verify whether the relationships between the independent variable and the dependent variables were linear in nature. The analysis was carried out using the ANOVA (Compare Means) procedure in SPSS version 25. The results of the linearity tests for the relationships between X and Y_1, as well as X and Y_2, are presented in Table 6.

Table 6. Linearity Test Results

Relationship	Sig. Linearity	Sig. Deviation
X*Y_1	0,180	0,180
X*Y_2	0,003	0,740

Based on Table 6, the significance value of the deviation from linearity for variable Y_1 was 0.180, while that for variable Y_2 was 0.740. Both values exceeded 0.05, indicating a linear relationship between Artificial Intelligence Integration in Microteaching (X) and Teaching Self-Confidence (Y_1), as well as between Artificial Intelligence Integration in Microteaching (X) and Teaching Anxiety (Y_2). Therefore, the linearity assumption was satisfied, and the data were deemed suitable for regression analysis.

Heteroscedasticity

The heteroscedasticity test was conducted to detect the presence of unequal residual variances in the regression model. This test was performed using the Glejser method, which involves regressing the absolute residual values on the independent variable. The results of the heteroscedasticity test are presented in Table 7.

Table 7. Homoscedasticity Test Results

Relationship	Sig.
X*Y1	0,079
X*Y2	0,025

Based on Table 7, the significance value for the effect of X on Y_1 was 0.079 (> 0.05), indicating the absence of heteroscedasticity. In contrast, the significance value for X on Y_2 was 0.026 (< 0.05), indicating the presence of heteroscedasticity. However, the regression analysis was still considered appropriate because of the relatively large sample size, which enhances the robustness of the estimation results.

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Linear Regression Analysis

Simple linear regression analysis was conducted to examine the effect of Artificial Intelligence Integration in Microteaching (X) on Teaching Self-Confidence (Y_1) and Teaching Anxiety (Y_2). The analysis was performed using the Enter method in SPSS version 25. The results of the simple linear regression analysis are presented in Table 8.

Table 8. Simple Linear Regression Analysis Results (Model Summary and ANOVA)

Dependent Variable	R	R^2	Sig.
Y_1	0,644	0,414	0,000
Y_2	0,297	0,088	0,002

Based on Table 8, the variable of Artificial Intelligence Integration in Microteaching demonstrated a strong relationship with Teaching Self-Confidence (R = 0.644) and a weak relationship with Teaching Anxiety (R = 0.297). The coefficient of determination (R^2) indicated that Artificial Intelligence Integration in Microteaching accounted for 41.4% of the variance in Teaching Self-Confidence and 8.8% of the variance in Teaching Anxiety. The remaining 58.6% and 91.2%, respectively, were attributable to factors not included in the research model. Both regression models were statistically significant (Sig. < 0.05), indicating that the proposed regression models were significant and suitable for explaining the relationships among the variables.

Table 9. Simple Linear Regression Coefficients (t-Test)

Dependent Variable	β(X)	t	Sig.
Y_1	0,726	8,449	0,000
Y_2	- 0,501	- 3,131	0,002

Based on Table 9, the results of the partial t-test indicate that Artificial Intelligence (AI) integration (X) had a positive and significant effect on students' Teaching Self-Confidence (Y_1) (Sig. = 0.000 < 0.05). On the other hand, AI integration (X) demonstrated a negative and significant effect on students' Teaching Anxiety (Y_2) (Sig. = 0.002 < 0.05).

The resulting regression equations are as follows:

$$Y_1 = 15{,}129 + 0{,}726\,X$$
$$Y_2 = 45{,}375 - 0{,}501\,X$$

The regression equations can be interpreted as follows: (1) A one-unit increase in Artificial Intelligence Integration in Microteaching (X) is associated with an increase of 0.726 units in students' Teaching Self-Confidence (Y_1); (2) For every one-unit increase in Artificial Intelligence Integration in Microteaching (X), students' Teaching Anxiety (Y_2) is predicted to decrease by 0.501 units; and (3) The constant value of 15.129 indicates that when Artificial Intelligence Integration in Microteaching (X) equals zero, students' Teaching Self-Confidence (Y_1) is predicted to have an initial value of 15.129. Meanwhile, the constant value of 45.375 indicates that when X equals zero, students' Teaching Anxiety (Y_2) is predicted to have an initial value of 45.375.

The results of the analysis indicate that the implementation of Artificial Intelligence (AI) in microteaching has a positive and significant effect on students' Teaching Self-Confidence

and a negative and significant effect on their Teaching Anxiety. These effects were evident both individually, as demonstrated by the t-test results, and collectively, as indicated by the F-test results. Therefore, an increase in the use of Artificial Intelligence (AI) in microteaching activities is associated with higher levels of Teaching Self-Confidence and lower levels of Teaching Anxiety among Mathematics Education students.

Discussion

The results of the simple linear regression analysis revealed that the integration of Artificial Intelligence (AI) in microteaching activities was significantly associated with both teaching self-efficacy (Y_1) and teaching anxiety (Y_2) among the participants. The coefficient of determination (R^2) for teaching self-efficacy was 0.414, indicating that AI integration accounted for 41.4% of the variance in teaching self-efficacy, while the remaining 58.6% was explained by other factors beyond the scope of the present study. In contrast, the coefficient of determination (R^2) for teaching anxiety was 0.088, indicating that AI integration accounted for 8.8% of the variance in teaching anxiety. The remaining 91.2% of the variance may be attributed to other factors, such as prior teaching experience, psychological readiness, individual characteristics, and learning environment conditions.

Further analysis of each indicator shows that in the confidence variable, the greatest influence appears on the confidence indicator in delivering learning material and the ability to manage class interaction. Students who utilize AI in the microteaching process tend to be more confident when explaining learning concepts, answering questions, and directing the course of learning. This happens because AI helps students in compiling learning tools, developing variations of material delivery methods, and providing classroom situation simulations that allow students to practice repeatedly before teaching practice directly. This condition gradually strengthens the perception of self-competence and increases teaching readiness.

In the teaching anxiety variable, the biggest impact is seen on anxiety indicators when speaking in front of the class and the concern of making mistakes when explaining the material. Students who use AI show lower levels of anxiety, especially when they have to start learning, explain material, or respond to questions from students. The utilization of features such as teaching simulation, automatic evaluation, and AI-based feedback helps students recognize their weaknesses from the practice stage, so that they can make improvements before facing the actual teaching situation. The repeated practice process helps students build a sense of security and reduce psychological pressure during the learning process.

This finding confirms that the integration of AI in microteaching not only contributes to improving the technical aspects of learning, but also strengthens the psychological aspects of students as prospective educators. The more intensively students use AI as a medium for training, reflection, and self-evaluation, the higher the self-confidence they build, and the lower the anxiety they feel when carrying out teaching practice. This finding is in line with the view Schunk & DiBenedetto (2020) who emphasized that learning experiences that provide continuous feedback can increase self-efficacy and help individuals manage pressure in performative situations.

This research has several limitations that need to be considered. First, it only involves a sample from one institution, so the results cannot be generalized broadly. In the second stage, data collection is carried out using questionnaires, which has the potential to cause subjectivity from the respondents. In addition, several factors were not fully controlled in this study, including individual psychological conditions, prior teaching experience, and learning environment characteristics. These factors may influence the levels of teaching self-efficacy and teaching anxiety among pre-service mathematics teachers. Therefore, the relationships

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identified in this study should be interpreted with consideration of these potential influences, as they may contribute to variations in students' psychological readiness and teaching performance.

In addition, several factors were not fully controlled in this study, including individual psychological conditions, prior teaching experience, and learning environment characteristics. These factors may influence the levels of teaching self-efficacy and teaching anxiety among pre-service mathematics teachers. Therefore, the relationships identified in this study should be interpreted with consideration of these potential influences, as they may contribute to variations in students' psychological readiness and teaching performance.

Relationship Between Artificial Intelligence Integration in Microteaching (X) and Students' Teaching Self-Efficacy (Y_1)

The regression analysis revealed a positive and statistically significant relationship between AI integration and students' teaching self-efficacy ($t = 8.449$, $p < .001$). This finding indicates that greater utilization of AI in microteaching activities was associated with higher levels of teaching self-efficacy, particularly in delivering instructional content, responding to questions, and facilitating classroom interactions. From a theoretical standpoint, these findings can be interpreted through Bandura's self-efficacy theory. Bandura posits that individuals' beliefs about their capabilities are shaped by mastery experiences, self-reflection, and the management of emotional states. In this study, AI facilitated these processes by providing support for instructional material preparation, opportunities for teaching simulations, and automated feedback on teaching performance. Such features enabled students to identify their strengths and areas for improvement, engage in repeated practice, and progressively refine their instructional skills (Vygotsky, 1987). As a result, the continuous cycle of practice, feedback, and reflection strengthened students' perceptions of their teaching competence, leading to higher levels of teaching self-efficacy. This finding is consistent with the work of Fadel et al. (2019), who reported that AI-based technologies can foster adaptive and reflective learning experiences, which are associated with enhanced learner self-efficacy.

Relationship Between Artificial Intelligence Integration in Microteaching (X) and Students' Teaching Anxiety (Y_2)

The regression analysis revealed a significant negative relationship between AI integration and students teaching anxiety ($t = -3.131$, $p = .002$). This finding indicates that greater use of AI in microteaching activities was associated with lower levels of teaching anxiety. Students who frequently utilized AI-supported tools reported reduced anxiety when presenting instructional materials, initiating classroom activities, and responding to learners questions during teaching practice. From a theoretical perspective, this relationship may be explained by the ability of AI to reduce uncertainty and enhance individuals sense of control over teaching situations. In microteaching activities, teaching anxiety often arises because students fear making mistakes, worry about being negatively evaluated by others, or lack confidence in the instructional materials they are expected to deliver (Goleman, 1995). AI can help alleviate these concerns by providing teaching simulations, performance evaluations, and improvement recommendations that can be accessed before actual teaching practice takes place. By offering opportunities for independent practice, early error correction, and identification of areas requiring improvement, AI enables students to prepare more effectively for teaching tasks. Consequently, students tend to develop greater psychological readiness and are better able to regulate their emotional responses in teaching situations. As a result, they become more capable of managing teaching-related stress and anxiety, leading to a more positive and confident

teaching experience. This finding is consistent with the studies conducted by Scherer et al. (2021) and Chen & Chen (2020), which reported that AI-based educational technologies are associated with more adaptive psychological conditions through the provision of constructive feedback and more flexible learning experiences. Such technologies enable learners to monitor their progress, identify areas for improvement, and engage in self-regulated learning processes. Consequently, students may develop greater confidence in their abilities and experience lower levels of anxiety when facing academic or teaching-related tasks.

Artificial Intelligence Integration in Microteaching as a Means of Enhancing Pre-Service Teachers Teaching Readiness

The findings of this study indicate that AI integration in microteaching is associated with students' teaching readiness in a comprehensive manner, encompassing both pedagogical and psychological dimensions. The use of AI in instructional material development, lesson planning, teaching simulations, and performance reflection enables students to prepare for teaching activities in a more systematic and structured way (Nasution, n.d.). This condition enables students to better understand their strengths and weaknesses before facing actual classroom teaching situations. This finding supports the views of Gwo-Jen Hwang et al. (2020), Viberg et al. (2020), and Xuesong Zhai et al. (2021), which suggest that AI can create learning experiences that are more personalized, interactive, and responsive to individual learners needs. Therefore, the integration of AI in microteaching can serve as an important component in developing pre-service teachers competencies that are more aligned with the demands of 21st-century education.

Implications of the Study for Lecturers and Higher Education Institutions

The findings of (Rahmawati, F., Nuraini, S., Fitriani, N., & Afriyanto, 2024) have significant implications for lecturers and higher education institutions in improving the quality of instruction, particularly in microteaching activities. From a practical perspective, Artificial Intelligence (AI) can be utilized as a learning support tool to help students prepare for teaching practice through simulations, automated feedback, and performance evaluation (Hama & Osam, 2021). This provides students with opportunities to practice independently, enhance their Teaching Self-Confidence, and reduce Teaching Anxiety before encountering actual classroom teaching situations. From a strategic perspective, educational institutions should formulate policies that support the integration of Artificial Intelligence (AI) technologies into teaching and learning processes. Such policies may include the provision of AI-based learning platforms, digital literacy training for both lecturers and students, and the incorporation of technology into educational curricula. These initiatives play a vital role in ensuring that educational practices remain aligned with the demands of the digital era and in enhancing the preparedness of pre-service mathematics teachers for their future professional roles as educators.

For study program administrators, the findings of this study may serve as a reference for designing more innovative and responsive curricula by integrating Artificial Intelligence (AI) into practice-oriented courses such as microteaching. In addition, they may develop technology-enhanced learning models that not only emphasize cognitive outcomes but also promote the affective and psychological development of pre-service mathematics teachers, particularly in terms of strengthening teaching self-efficacy and managing teaching anxiety. Overall, the integration of Artificial Intelligence (AI) into educational practices has the potential to enhance teaching effectiveness by providing timely and personalized feedback, facilitating systematic monitoring of student development, and supporting data-informed instructional decisions. In

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this context, lecturers serve as facilitators who guide pre-service mathematics teachers in the effective and responsible use of technology to support both learning and professional growth. Furthermore, the integration of AI in microteaching aligns with the principles of the Merdeka Belajar Kampus Merdeka (MBKM) initiative, which promotes the development of critical thinking, independence, adaptability, and professional readiness among pre-service mathematics teachers to meet the evolving demands of education in the digital age.

Conclusion

Based on the findings of this study, the integration of Artificial Intelligence (AI) in microteaching activities was found to be significantly associated with both teaching self-efficacy and teaching anxiety among students in the Mathematics Education Study Program. The results revealed that AI integration had a relatively strong predictive relationship with teaching self-efficacy, with a coefficient of determination of $R^2 = 0.414$. This indicates that AI integration accounted for 41.4% of the variance in teaching self-efficacy among the participants. In contrast, AI integration demonstrated a significant negative relationship with teaching anxiety, with a coefficient of determination of $R^2 = 0.088$. This finding indicates that AI integration accounted for 8.8% of the variance in teaching anxiety. Although the relationship was statistically significant, the relatively small R^2 value suggests that other factors beyond the scope of the present study also contribute to variations in students teaching anxiety.

Overall, the findings suggest that the integration of AI in microteaching may support the pedagogical and psychological preparedness of pre-service mathematics teachers by enhancing teaching self-efficacy and reducing teaching anxiety. However, further research is needed to explore additional factors that may influence teaching anxiety and to provide a more comprehensive understanding of the role of AI in teacher education. These findings suggest that the use of AI in microteaching is associated with the readiness of pre-service teachers, particularly in terms of their psychological and pedagogical preparedness for teaching practice in the digital era. In addition to providing empirical evidence for the development of technology-enhanced learning, this study also offers directions for future research.

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Conflict of Interest

The authors declares that there is no conflict of interest.

Auhor Contributions

L.F.U., N.D.H., and A.H.K. contributed equally to developing the research title, formulating the initial manuscript, and constructing the basic research framework. All three authors were actively involved in writing the journal manuscript, drafting sentences, as well as analyzing and processing the research data. N. provided suggestions on the research title and assisted in writing the manuscript. F.N. contributed by searching for supporting references but was not

directly involved in the research process. All authors confirm that they have read and approved the final version of the manuscript. The percentage contributions of each author in conceptualization, writing, and revision are as follows: L.F.U.: 25%, N.D.H..: 25%, N.: 15%, A.H.K.: 25% and F.N.: 10%.

Data Availability Statement

The authors state that the data supporting the findings of this study are available from the corresponding author, [L.F.U.], upon reasonable request.

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