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Research Paper

Teacher AI Readiness and Technology-Enhanced Teaching: The Mediating Role of AI Self-Efficacy

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Abstract

Artificial Intelligence (AI) is becoming more and more integral to lesson planning, assessment, feedback and classroom activity. But having access to AI tools doesn't automatically equate to meaningful technology enhanced teaching. Teachers also must be prepared, ethically conscious, and confident in their use of AI. This study investigates the correlation between teachers' readiness to use AI and the use of technology for teaching and analyzes if this correlation is mediated by the teachers' self-efficacy in using AI. The design of the study used was quantitative, cross-sectional correlational that involved 100 teachers at public and private institutions. AI readiness of teachers was selected as the independent variable, AI self-efficacy as the dependent variable, and technology-enhanced teaching as the mediator. Frequencies, descriptive statistics, reliability analysis, Pearson correlations, regression, and Hayes' PROCESS Model 4 with 5,000 bootstrap samples were used in the analysis. The findings show that there were positive and significant relationships between all three variables. AI readiness positively correlated with the AI self-efficacy, and AI self-efficacy positively correlated with the technology enhanced teaching. The mediation analysis revealed that AI readiness, as a mediator, was associated with the indirect effect between teacher AI readiness and technology-enhanced teaching. The results underscore the value of hands-on professional development, ethical application of AI, and institutional support for boosting teacher confidence and integration of AI in their classrooms.

Keywords: Artificial Intelligence, Teacher AI Readiness, AI Self-Efficacy, Technology-Enhanced Teaching, Teacher Education, Educational Technology.

Introduction

AI has emerged as a key component of modern education. AI-powered apps can help teachers prepare lessons, provide examples, create assessment activities, give feedback, provide support for students, and implement personalized learning. However, with its quick evolution, Generative AI has brought new opportunities and new obligations. Along with using AI tools, teachers are also expected to assess the results produced by AI, be aware of ethical concerns, safeguard human creativity, and determine when AI is appropriate for pedagogy.The UNESCO AI Competency Framework for Teachers defines the competencies in five categories: a human-centred mindset; ethics of AI; AI foundations and applications; AI pedagogy; and AI for professional learning (Miao & Cukurova, 2024). The emphasis in this framework is on knowledge, skills, values, and professional judgment in achieving effective use of AI. Chiu et al. (2024) also differentiate between AI literacy and AI competency, stating that AI competency encompasses confidence, application, ethics, collaborative use, and self-reflection.The readiness of teachers is thus a crucial construct. The readiness in this study is a teacher's thinking, emotional, and behavioral preparedness to comprehend and embrace, assess and apply AI in educational and professional settings. AI readiness has recently been considered a measurable construct and correlated with technology-related self-efficacy, interaction, and ethical awareness (Ramazanoglu & Akın, 2025; Wang et al., 2025). But being ready doesn't guarantee classroom adoption. A teacher might understand the potential of AI and feel willing to incorporate AI into their teaching, but lack confidence.This psychological aspect is tackled by AI self-efficacy. The self-efficacy theory (Bandura, 1986) is relevant for this study and is defined as the expectation of the individual with regard to his or her ability to coordinate and execute actions for attaining a desired outcome. Self-efficacy in AI education refers to teachers' confidence in effectively, appropriately, and responsibly incorporating AI into their practice.Self-efficacy in the context of AI education is a teacher's confidence in using AI effectively, appropriately, and responsibly. Chiu et al. (2025) have created the Teacher AI competence self-efficacy scale with six dimensions: AI knowledge, AI pedagogy, AI assessment, AI ethics, human-centred education and professional engagement. Collie et al. (2024) additionally described a relationship between teachers' generative-AI self-efficacy and the extent to which they were integrating AI in their work.In this study, technology-enhanced teaching refers to the intentional and goal-directed application of digital and AI-supported tools in the planning, teaching, assessment, feedback, interaction and learning processes in lessons. The TPACK framework (Mishra & Koehler, 2006) is useful as a starting point as meaningful technology use relies on the intersection of technological, pedagogical, and content knowledge. The present study therefore suggests that teacher AI readiness could directly and indirectly affect the technology enhanced teaching, mediated with teacher's AI self-efficacy.

Research Gap

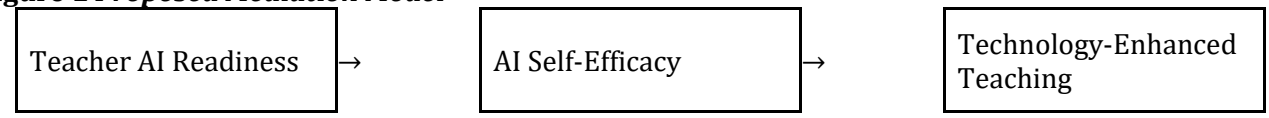
While teachers have access to more and more technologies with AI capabilities, this does not always mean they are used in the classroom. While teachers might have access, they may not have a good understanding, ethical awareness, pedagogical insight or confidence regarding generative AI. The current literature has explored the concepts of AI literacy, competence, acceptance, readiness and self-efficacy, but in comparison, less research has looked at the mechanism through which teacher AI readiness influences the use of technology in teaching with AI using AI-specific self-efficacy. The relationship between readiness and AI self-efficacy has attracted growing research interest in recent years, with research increasingly positing that they are separate constructs (Chiu et al., 2025; Ramazanoglu & Akın, 2025). The evidence from the developing educational context such as in Pakistan is also limited when compared with other contexts. This study aims to fill these gaps by examining the role of AI self-efficacy in the relationship between AI readiness among teachers and the use of AI for teaching.

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Theoretical and Conceptual Framework

The study is mainly based on Bandura's Social Cognitive Theory (1986), which posits that there are reciprocal relationships between personal factors, behaviours and the environment. Self-efficacy is the key factor because self-efficacy beliefs affect effort, persistence, choice, and behavior. Teacher AI readiness is preparedness in the present model; and AI self-efficacy is the psychological mechanism in the present model, while technology-enhanced teaching is teaching behavior. The TPACK framework also supports the model as it explains that to be effective, teachers need to link technological knowledge, pedagogy and content knowledge when integrating technology (Mishra & Koehler, 2006).The independent variable (X) is teacher AI readiness, the mediator variable is AI self-efficacy, and the dependent variable (Y) is technology-enhanced teaching. The model is testing both direct and indirect ways of travelling from X to Y via M.The conceptual framework of the study is shown in Figure 1. Teacher AI readiness (IV) is hypothesized to mediate the relationship between AI self-efficacy and technology-enhanced teaching (DV). This direct relationship between teacher AI readiness and technology-enhanced teaching will also be explored.

Figure 1 ***Proposed Mediation Model***



Note. The model also tests the direct path from teacher AI readiness to technology-enhanced teaching.

Literature Review

There has been a significant surge in the research of AI in the field of education. Chiu et al. (2023) highlighted significant opportunities and challenges in the application of AI in education and called for a responsible approach. Sperling et al. (2024) demonstrated that AI literacy in teacher education is a field that is ongoing. The UNESCO framework then offered a more comprehensive competency framework for teachers, focusing on human-centred practice, ethics, foundations of AI, pedagogy and professional learning (Miao & Cukurova, 2024).The significance of teacher competence and preparedness is supported by empirical research. Ayanwale et al. (2024) investigated the level of AI literacy among pre-service teachers, and Delcker et al. (2025) created an instrument that would help teachers self-assess their level of AI competence. The studies show that AI competence is multifaceted and nothing can be summarised as the use of AI tools. Ramazanoglu and Akın (2025) and Wang et al. (2025) also highlight the development of the construct of teacher AI readiness.AI self-efficacy has also gained in significance over time. Chiu et al. (2025) created the Teacher Artificial Intelligence Competence Self-Efficacy Scale with six dimensions of teacher competence with AI. Chou et al. (2024) created and tested a self-efficacy scale for AI assisted teaching applications. Collie et al. (2024) discovered that teachers' self-efficacy for generative-AI is positively correlated with their work integration of AI. We found professional development that focused on lesson planning, classroom practice, reflection, and community support to build teacher self-efficacy in integrating AI-based technology had a positive impact on their self-efficacy, in accordance with the findings of Yang et al. (2024). Another point of interest made by Hava and Babayiğit (2025) is the importance of AI-TPACK and digital proficiency for teachers' AI-related competence.The literature indicates that there is consensus that preparedness and confidence are important issues in AI-supported teaching. The mediators between teacher AI readiness and TEL, however, are comparatively under-researched, with relatively less attention given to the mediating role of AI self-efficacy. The present study fills this gap by examining the three constructs together in a single mediation model.

Method and Material

The quantitative, cross-sectional correlational design was employed to explore the correlation between teacher AI readiness, AI self-efficacy, and technology-enhanced teaching. Public and private institution teachers (N = 100). Time and resource constraints precluded other sampling methods, and convenience

sampling was chosen instead. Participants had to be currently working as teachers, have access to a smartphone, computer or to a device that can connect to the Internet, have basic knowledge of digital educational technologies and have agreed to take part in the questionnaire.

Instrument

The structured questionnaire contained demographic information and three main scales. The teacher AI readiness was measured using 10 items adapted by the researchers from the previous studies in the field of teacher competency in AI, primarily based on UNESCO's teacher AI competency framework (Ramazanoglu and Akın, 2025) and other studies on teacher competence in AI. Ten items based on Chou et al. (2024) and Chiu et al. (2025) were adapted to measure the level of AI self-efficacy. Technical support for teaching was assessed based on 10 items concerning the use of technology and AI in planning, teaching, assessment, feedback and engagement. Items had a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree.

Validity, Reliability and Data Analysis

The questionnaire was designed to be read by those who are knowledgeable in education, educational technology or educational psychology and a pilot study was to be conducted prior to administration of the questionnaire to the main population. Cronbach's alpha was used as a measure of internal consistency. Demographic data and frequencies and percentages were generated using SPSS. Means and SDs were reported, and reliability was assessed. Pearson correlations, regression analysis and Hayes' PROCESS Macro Model 4 were used. A 5,000 bootstrap sample and a 95% confidence interval were used to evaluate mediation. The significance of an indirect effect was determined by whether the 95% confidence interval contained zero or not.

Results and Discussion

The results are reported in the sequence of research questions. The analyses for Research Questions 1-3 are presented following demographic and descriptive statistics used to describe the sample and the study variables. All analyses were run in SPSS and the mediation model was tested via the PROCESS macro (Model 4).

Demographic Profile and Descriptive Statistics

Table 1. Frequencies and Percentages for Demographic Variables (N = 100)

Variable	Category	Frequency	Percent	Valid Percent	Cumulative Percent
Gender	Male	44	44.0	44.0	44.0
	Female	56	56.0	56.0	100.0
	Total	100	100.0	100.0	
Age	20–30 years	38	38.0	38.0	38.0
	31–40 years	41	41.0	41.0	79.0
	41–50 years	15	15.0	15.0	94.0
	51+ years	6	6.0	6.0	100.0
	Total	100	100.0	100.0	
Qualification	Bachelor's	29	29.0	29.0	29.0
	Master's	54	54.0	54.0	83.0
	M.Phil. / Ph.D.	17	17.0	17.0	100.0
	Total	100	100.0	100.0	
Experience	1–5 years	35	35.0	35.0	35.0
	6–10 years	42	42.0	42.0	77.0
	11+ years	23	23.0	23.0	100.0

	Total	100	100.0	100.0	
Institution	Public	48	48.0	48.0	48.0
	Private	52	52.0	52.0	100.0
	Total	100	100.0	100.0	

Note. Output from SPSS Frequencies procedure.

Table 1 shows that the sample contained 44% male and 56% female teachers. The largest age group was 31–40 years (41%), followed by 20–30 years (38%). More than half of the participants held a master's qualification (54%), while 17% held M.Phil./Ph.D. qualifications. In terms of experience, 42% had 6–10 years of experience. Public and private institutions contributed 48% and 52% of the sample, respectively.

Table 2. Descriptive Statistics of the Study Variables (N = 100)

Variable	N	Mean	Std. Deviation	Skewness		Kurtosis	
				Statistic	Std. Error	Statistic	Std. Error
Teacher AI Readiness	100	3.62	.58	-.214	.241	-.105	.478
AI Self-Efficacy	100	3.51	.62	-.189	.241	-.312	.478
Technology-Enhanced Teaching	100	3.68	.54	-.301	.241	.044	.478
Valid N (listwise)	100						

Note. Output from SPSS Descriptives procedure. Scale range = 1–5.

Table 3. Reliability Statistics (Cronbach's Alpha)

Scale	Cronbach's Alpha	N of Items
Teacher AI Readiness	.86	10
AI Self-Efficacy	.89	10
Technology-Enhanced Teaching	.87	10

Note. Output from SPSS Reliability Analysis.

Table 2 indicates relatively high mean scores for all three constructs. Technology-enhanced teaching had the highest mean (M = 3.68, SD = .54), followed by teacher AI readiness (M = 3.62, SD = .58) and AI self-efficacy (M = 3.51, SD = .62). Skewness and kurtosis values were small, suggesting no major departure from normality. As shown in Table 3, Cronbach's alpha values ranged from .86 to .89, indicating strong internal consistency for all three scales.

Research Question 1: Relationships among the Study Variables

Table 4. Pearson Correlations among Study Variables (N = 100)

Variable		1. Teacher AI Readiness	2. AI Self-Efficacy	3. Technology-Enhanced Teaching
1. Teacher AI Readiness	Pearson Correlation	1	.642**	.584**
	Sig. (2-tailed)		.000	.000
	N	100	100	100
2. AI Self-Efficacy	Pearson Correlation	.642**	1	.691**
	Sig. (2-tailed)	.000		.000
	N	100	100	100
3.Technology-Enhanced Teaching	Pearson Correlation	.584**	.691**	1
	Sig. (2-tailed)	.000	.000	

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	N	100	100	100

***. Correlation is significant at the 0.01 level (2-tailed).*

Table 4 shows significant positive correlations among the three variables. Teacher AI readiness was strongly associated with AI self-efficacy (r = .642, p < .001) and moderately associated with technology-enhanced teaching (r = .584, p < .001). AI self-efficacy had a strong positive relationship with technology-enhanced teaching (r = .691, p < .001). Research Question 1 is therefore answered affirmatively: the three variables are significantly and positively related to one another.

Research Question 2: Effect of Teacher AI Readiness

Table 5. Model Summary for the Mediation Models (PROCESS Model 4)

Model	Dependent Variable	Predictor(s)	R	R Square	F	df1	df2	Sig.
1	AI Self-Efficacy	Teacher AI Readiness	.642	.412	69.56	1	98	.000
2	Technology-Enhanced Teaching	Teacher AI Readiness, AI Self-Efficacy	.722	.521	52.74	2	97	.000

Note. Output from PROCESS Macro, Model 4.

Table 6. Regression Coefficients for the Mediation Model (PROCESS Model 4)

Outcome / Predictor	B	Std. Error	t	Sig.	LLCI	ULCI
Outcome: AI Self-Efficacy (M)						
Constant	1.034	.298	3.47	.001	.443	1.625
Teacher AI Readiness (a)	.684	.082	8.34	<.001	.521	.847
Outcome: Technology-Enhanced Teaching (Y)						
Constant	1.250	.245	5.10	<.001	.764	1.736
AI Self-Efficacy (b)	.462	.078	5.92	<.001	.307	.617
Teacher AI Readiness (c′)	.224	.081	2.77	.007	.063	.385
Total Effect Model						
Teacher AI Readiness (c)	.540	.076	7.11	<.001	.389	.691

Note. LLCI and ULCI = lower and upper limits of the 95% confidence interval.

Tables 5 and 6 present the regression models estimated within PROCESS Model 4. Teacher AI readiness significantly predicted AI self-efficacy (B = .684, SE = .082, t = 8.34, p < .001) and explained 41.2% of its variance. The total effect of teacher AI readiness on technology-enhanced teaching was also significant (B = .540, SE = .076, t = 7.11, p < .001). When AI self-efficacy was added to the model, it significantly predicted technology-enhanced teaching (B = .462, SE = .078, t = 5.92, p < .001), and teacher AI readiness retained a significant direct effect (B = .224, SE = .081, t = 2.77, p = .007). The two predictors together explained 52.1% of the variance in technology-enhanced teaching. Research Question 2 is therefore answered affirmatively: teacher AI readiness significantly predicts both AI self-efficacy and technology-enhanced teaching.

Research Question 3: Mediating Role of AI Self-Efficacy

Table 7. Bootstrap Total, Direct and Indirect Effects of Teacher AI Readiness

Effect	Effect (B)	Boot SE	BootLLCI	BootULCI	% of Total Effect
Total Effect (c)	.540	.076	.389	.691	100.0%
Direct Effect (c′)	.224	.081	.063	.385	41.5%
Indirect Effect (a × b)	.316	.064	.198	.452	58.5%

Note. Bootstrap samples = 5,000; confidence level = 95%.

Table 7 provides evidence for mediation. The indirect effect was .316, with a bootstrap 95% confidence interval from .198 to .452. Because zero is not included in the interval, the indirect effect is statistically

significant. The indirect path accounts for 58.5% of the total effect, while the remaining direct effect accounts for 41.5%. Thus, AI self-efficacy partially mediates the relationship between teacher AI readiness and technology-enhanced teaching, and Research Question 3 is answered affirmatively.

Discussion

The results support the proposed view that teacher AI readiness is related to AI self-efficacy. Schooled teachers who have higher awareness and understanding about the nature of AI, as well as better understanding and evaluation capabilities, might also feel more confident of using AI in educational practices. This finding aligns with the conceptualization of AI competence by Chiu et al. (2024), which goes beyond mere knowledge, and with the view of self-efficacy as a part of multiple dimensions of teacher AI competence, provided by Chiu et al. (2025). The significant association between AI self-efficacy and technology-enhanced teaching also agrees with previous research. Collie et al. (2024) concluded that teachers' generative-AI self-efficacy was positively correlated with AI use in their work. Similarly, Yang et al. (2024) demonstrated that hands-on professional development can boost teachers' confidence in technology integration with AI. The results indicate that trust is crucial in the transition from being aware of AI to its actual use in education. The mediation result is very significant. Indirect effect is another significant path that AI readiness might relate to technology-enhanced teaching, potentially via teachers' confidence in their AI skills. In reality, offering teachers AI tools might not be enough. Learning should involve practical experience, planning of lessons, assessment activities, reflection and feedback, to allow teachers to gain mastery experiences and confidence. The result also confirms the perception that comes with the Social Cognitive Theory, which suggests that beliefs can be used to explain how preparedness is manifested in behaviour. The results also support TPACK, as using AI in education teaching cannot be accomplished without being supported by technical access. Teachers should determine if an AI application is suitable for the subject, pedagogy, learning objective, assessment process, and ethics. Hence, teacher development should focus on the integration of AI knowledge, pedagogical decision making, and responsible AI use.

Implications

AI literacy, AI pedagogy, ethical use of AI, critical review of AI-generated content, and design of lessons with the support of AI should be part of teacher education programs. Professional development should offer practical activities, not just theory. AI can be effectively leveraged for lesson planning, assessment, feedback, differentiation, and engagement in education under the guidance and oversight of teachers. A guarantee of reliable technology, internet access, technical support and clear policies regarding privacy, bias, academic integrity, transparency and responsible use as well. AI can be integrated with consistency and integrity using competency-based guidance from educational authorities.

Limitations and Recommendations

There are a number of limitations to the study. The sample size of 100 teachers reduces the power and generalizability of the statistics, while convenience sampling reduces the generalizability of any findings. The cross-sectional design does not show clear causal relationships. Social desirability can also impact self-reported responses. Also, the importance of being prepared and self-efficacy may vary across time due to the rapid evolution of AI technologies. Larger probability samples, longitudinal studies and public vs private comparison studies would be valuable in future research. Future research can also explore whether AI training acts as a moderator and if the changes in readiness and self-efficacy are predictive of later readiness or self-efficacy.

Conclusion

This study is a demonstration of a model of teacher AI readiness, AI self-efficacy, and TE. The three research questions were supported by significant and positive relationships between the three variables, significant prediction of AI self-efficacy by teacher AI readiness and significant partial mediation of the relationship

between teacher AI readiness and technology-enhanced teaching by teacher AI self-efficacy. The results reported indicate that all three constructs are correlated with each other, and that AI self-efficacy acts as a mediator between the three. The results indicate that teachers' readiness is better to influence the meaningful use of technology enhanced teaching practices when combined with confidence in the use of AI. The study therefore confirms an approach to professional development, which is not only technical and pedagogical but also ethical, technical and pedagogical mastery and institutional support.

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