

The Effect of Artificial Intelligence on Pedagogical Readiness with Digital Literacy as a Mediating Variable

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ARTICLE INFO

Keywords: Artificial Intelligence, Digital Literacy, Pedagogical Readiness.

Received : 17, July

Revised : 19, August

Accepted: 25, September

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ABSTRACT

This study examined the effects of Artificial Intelligence on digital literacy and pedagogical readiness, as well as the effect of digital literacy on pedagogical readiness and its mediating role in the relationship between Artificial Intelligence and pedagogical readiness among Primary Teacher Education students at IAIN Curup. A quantitative explanatory design was employed. The population comprised 240 second-semester students, with 136 respondents selected through random sampling. Data were collected using a five-point Likert-scale questionnaire based on indicators of the study variables. Data were analyzed using Partial Least Squares Structural Equation Modeling (SEM-PLS) with SmartPLS, involving outer and inner model assessments. The results showed that Artificial Intelligence positively and significantly influenced digital literacy and pedagogical readiness. Digital literacy also significantly predicted pedagogical readiness and mediated the relationship between Artificial Intelligence and pedagogical readiness.

INTRODUCTION

Digital technology development has brought significant changes to the field of education, particularly through the growing implementation of Artificial Intelligence (AI) in learning processes. AI is no longer viewed merely as a technological support tool, but has become an essential component of academic activities, including information searching, learning material preparation, assignment evaluation, and students' independent learning (Heddouche, 2024). The transformation of digital education accelerated in the post-pandemic era, when technology-based learning became a major necessity within modern educational systems (Jameson et al., 2023). This condition requires students and prospective teachers to possess the ability to utilize technology effectively in supporting learning activities. The presence of AI facilitates access to information and helps students understand learning materials in faster, more flexible, and adaptive ways (Fotsing et al., 2023).

However, the use of AI in education also presents several challenges. Uncontrolled technology use may lead to technological dependency, reduced critical thinking skills, and ethical issues related to digital information use (Petit, 2022). Therefore, the implementation of AI in education must be balanced with adequate digital literacy and pedagogical readiness to ensure that technology is used effectively and responsibly. Artificial Intelligence in education has developed through various implementations such as adaptive learning, intelligent tutoring systems, learning analytics, and generative AI that support personalized and interactive learning (Guin, 2022). These technologies provide significant opportunities to improve learning effectiveness because AI can deliver rapid and data-driven access to information (Chevret-Castellani et al., 2022). In addition, AI can enhance creativity and innovation in learning when appropriately integrated into educational environments (Roy & Poëllhuber, 2023).

Previous studies have shown that AI use can support the development of reflective skills and pedagogical competencies among prospective teachers (محمد, 2023). AI is also considered a technology that can help students develop self-directed learning abilities and twenty-first century skills required in modern education (Cantero et al., 2024). Nevertheless, AI implementation requires not only technical skills in technology use, but also the ability to understand, evaluate, and critically utilize digital information. (Pratiwi et al., 2025) explained that the use of AI without adequate digital competence may create dependency on technology in learning activities. Therefore, the integration of AI in education must be supported by digital literacy skills so that students can use technology effectively and responsibly.

Digital literacy has become one of the essential competencies supporting the successful integration of AI in education. Digital literacy is not limited to the ability to operate digital devices, but also includes the ability to evaluate information, understand digital ethics, manage information, and utilize technology critically (Shiri, 2024). In modern educational contexts, digital literacy is a fundamental requirement because students must adapt to increasingly complex technological developments. Studies indicate that digital literacy is

associated with learning effectiveness, student engagement, and students' adaptability in digital learning environments (Z. Lin, 2025). Furthermore, AI literacy and digital competence are regarded as crucial competencies for educators and prospective teachers in the era of digital transformation (Mikeladze et al., 2024). Students with strong digital literacy skills tend to be more capable of utilizing AI to support academic activities and independent learning (Hidayat-ur-Rehman, 2024). Therefore, digital literacy is expected to play an important role in improving students' pedagogical readiness.

Pedagogical readiness is an essential competency that prospective teachers must possess to face educational changes in the digital era. Pedagogical readiness includes the ability to understand student characteristics, design learning activities, use instructional media, and integrate technology into teaching processes (Handayani et al., 2024). Technological advancement has shifted pedagogical competence beyond conventional teaching skills toward the integration of technology in learning. Previous studies have demonstrated that digital competence is associated with teaching readiness and the effectiveness of technology-based learning (Ais et al., 2023). The TPACK model also emphasizes the importance of integrating technology, pedagogy, and content to improve twenty-first century learning quality (Yopi, 2024). In addition, pedagogical readiness is influenced by technological adaptation skills and the use of digital media in learning activities (Maksimović & Lazić, 2023). (Zhang & Zhang, 2024) explained that AI in education opens new dimensions for developing digital literacy and pedagogical competence.

Based on previous studies, research examining the simultaneous relationship among Artificial Intelligence, digital literacy, and pedagogical readiness remains limited. Most previous studies have focused separately on AI literacy or digital competence (Shiri, 2024). Research investigating the mediating role of digital literacy in the relationship between AI and pedagogical readiness is also still limited. In fact, digital literacy is expected to explain how AI use can improve students' pedagogical readiness. Therefore, this study aims to examine the effect of Artificial Intelligence on pedagogical readiness, the effect of Artificial Intelligence on digital literacy, the effect of digital literacy on pedagogical readiness, and the mediating role of digital literacy in the relationship between Artificial Intelligence and pedagogical readiness using the SEM-PLS approach. The hypotheses of this study are: H1, Artificial Intelligence positively affects pedagogical readiness; H2, Artificial Intelligence positively affects digital literacy; H3, digital literacy positively affects pedagogical readiness; and H4, digital literacy mediates the positive effect of Artificial Intelligence on pedagogical readiness

THEORETICAL REVIEW

Artificial Intelligence and Pedagogical Readiness

Artificial intelligence (AI) is increasingly transforming educational practices and creating new demands for prospective teachers to develop appropriate technological and pedagogical capabilities (Jameson et al., 2023; Lison & Verchier, 2023). AI-supported learning, intelligent tutoring, adaptive

learning, learning analytics, and academic applications demonstrate its growing relevance to teaching and learning processes (Cerisier & Pierrot, 2022; Heddouche, 2024). AI integration also requires critical thinking, creativity, ethical awareness, and reflective teaching practices (Petit, 2022; Roy & Poëllhuber, 2023). Research further indicates that AI literacy, digital competence, and AI-related skills are increasingly important for effective educational practice (Biagini, 2024; Mikeladze et al., 2024). AI and digital competencies have also been associated with learning achievement, engagement, autonomous learning, and twenty-first-century skills (Cantero et al., 2024; C. Lin et al., 2025). Teacher readiness is similarly related to digital competence, TPACK, self-efficacy, and preparedness for technology-supported instruction (Astapenko, 2023; Lidinillah et al., 2021). Recent studies specifically connect AI literacy, AI self-efficacy, competence, attitudes, and digital competence with teachers' AI readiness and pedagogical practices (Huang & Zhao, 2025; Rütli-Joy et al., 2023). However, the direct relationship between AI and pedagogical readiness among prospective teachers remains insufficiently examined, providing a basis for proposing that Artificial Intelligence positively affects Pedagogical Readiness.

Artificial and Digital Literacy

Artificial Intelligence (AI) is increasingly becoming an important component of digital learning, influencing how learners' access, evaluate, process, and use digital information and technologies. The development of AI in education requires learners and educators to possess digital skills that enable them to interact critically and responsibly with AI-supported environments (Giroux et al., 2024; Lison & Verchier, 2023). Research on AI literacy emphasizes that understanding AI concepts and applications can strengthen individuals' ability to navigate increasingly complex digital environments (Biagini, 2024; Mikeladze et al., 2024). AI-supported learning applications may also facilitate information access, learning activities, autonomous learning, and the development of digital practices (Bouchereau & Roxin, 2022; Fotsing et al., 2023). Moreover, AI integration is closely connected with information and media literacy, digital competence, and ethical technology use (Aiyebelehin et al., 2025; Tiernan et al., 2023). In teacher education, AI competence and digital competence are increasingly regarded as important foundations for effective technology-supported learning and teaching (Ng et al., 2023; Yeter et al., 2024).

Empirical evidence also indicates that AI literacy and AI-related competencies are associated with digital learning, engagement, autonomous learning, and technological practices (Hidayat-ur-Rehman, 2024; H. Lin & Chen, 2025). Consequently, greater exposure to and effective use of AI may strengthen learners' capacity to use, evaluate, and manage digital technologies, suggesting a positive relationship between AI and Digital Literacy. Therefore, this study proposes the hypothesis that Artificial Intelligence has a positive effect on Digital Literacy.

Digital Literacy and Pedagogical Readiness

Digital literacy has become a fundamental capability for prospective teachers because effective teaching increasingly requires the ability to access, evaluate, process, create, and use digital information and technologies appropriately (Colvert, 2022; Ostanina et al., 2023). The development of digital

competence is particularly important in technology-supported education, where teachers are expected to integrate digital resources, manage online learning, and respond to changing technological environments (Chama & Subaveerapandiyan, 2023; Lidinillah et al., 2021). Digital literacy also supports pedagogical competence by enabling teachers to select appropriate technologies, design learning activities, use instructional media, and develop students' digital capabilities (Ais et al., 2023; Rintayati & Syawaludin, 2022). In teacher education, digital competence and TPACK have been associated with teaching preparedness and the capacity to implement technology-supported instruction effectively (Handayani et al., 2024; Maghfiroh et al., 2024). The increasing integration of artificial intelligence further expands these requirements because teachers need digital and AI-related competencies to use emerging technologies critically, ethically, and pedagogically (Lison & Verchier, 2023; Mikeladze et al., 2024).

Research additionally connects AI literacy, digital competence, self-efficacy, and technology-supported learning with teachers' readiness for digitally transformed education (Pratiwi et al., 2025; Rütli-Joy et al., 2023). Digital literacy may therefore provide prospective teachers with the practical and cognitive resources required to translate technological knowledge into pedagogical preparation and classroom practices (Astapenko, 2023; Sisson, 2023). Accordingly, the limited direct empirical examination of how digital literacy contributes to pedagogical readiness provides a basis for proposing that Digital Literacy has a positive effect on Pedagogical Readiness.

Digital Literacy mediates Artificial Intelligence and Pedagogical Readiness

Artificial Intelligence (AI) is increasingly transforming educational environments, creating new opportunities for learning while simultaneously requiring learners and prospective teachers to develop appropriate digital capabilities (Jameson et al., 2023; Lison & Verchier, 2023). The integration of AI into educational applications, intelligent tutoring, adaptive learning, and digital platforms requires users to access, evaluate, process, and apply digital information effectively (Cerisier & Pierrot, 2022; Heddouche, 2024). AI literacy and digital literacy are consequently interconnected competencies that support effective participation in increasingly AI-mediated learning environments (Biagini, 2024; Mikeladze et al., 2024). Empirical research indicates that AI literacy, digital competence, and AI-supported learning are associated with digital learning practices, autonomous learning, engagement, and technological capability (Cantero et al., 2024; Wulandari et al., 2024). Within teacher education, digital competence contributes to teachers' ability to integrate technology into instructional planning, implementation, assessment, and classroom practice (Maghfiroh et al., 2024; Ostanina et al., 2023).

At the same time, AI competence, AI literacy, self-efficacy, and digital competence have been associated with teachers' readiness and capacity to engage with AI-supported pedagogical practices (Erol, 2025; Rütli-Joy et al., 2023). These findings suggest that AI may contribute to pedagogical readiness not only directly but also by strengthening the digital literacy required to translate technological capabilities into appropriate pedagogical practices. The mediating

mechanism is further supported by evidence connecting digital competence with teaching preparedness and by research identifying AI literacy and digital competencies as important resources for technology-integrated education (Lidinillah et al., 2021; Rahimi & Tafazoli, 2022). Therefore, this study proposes that Digital Literacy mediates the positive effect of Artificial Intelligence on Pedagogical Readiness, examining whether AI contributes to pedagogical readiness through the development and application of digital literacy among prospective teachers.

METHODOLOGY

This study employed a quantitative approach with an explanatory research design to examine the causal relationships among Artificial Intelligence, digital literacy, and pedagogical readiness among PGMI students at IAIN Curup. The explanatory approach was applied because the study focused on testing the direct and indirect effects among variables using SEM-PLS (Gandhi & Gani, 2024). The research population consisted of 240 second-semester PGMI students, while 136 respondents were selected using random sampling to ensure that each population member had an equal opportunity to be chosen as a sample. The sample size fulfilled the SEM-PLS requirement of 5–10 times the number of research indicators. Since this study included 21 indicators, the minimum required sample ranged from 105 to 210 respondents (Shahzad et al., 2025). The Artificial Intelligence variable was measured through the ability of AI to support learning activities and information access, digital literacy was measured through the ability to use and evaluate digital information, while pedagogical readiness was measured through students' readiness to design and implement technology-based learning (Özüdoğru & Durak, 2025). Data were collected using a 5-point Likert scale questionnaire and analyzed using Smart PLS through sequential outer model and inner model evaluations

RESEARCH RESULTS

Data analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to examine both direct relationships and mediating effects among the variables in the research model. The evaluation process was carried out systematically by separating the assessment of the measurement model (outer model) and the structural model (inner model). Structural model estimation was generated through the bootstrapping procedure and visualized in Figure 1 to provide an initial overview of the relationship patterns among the constructs.

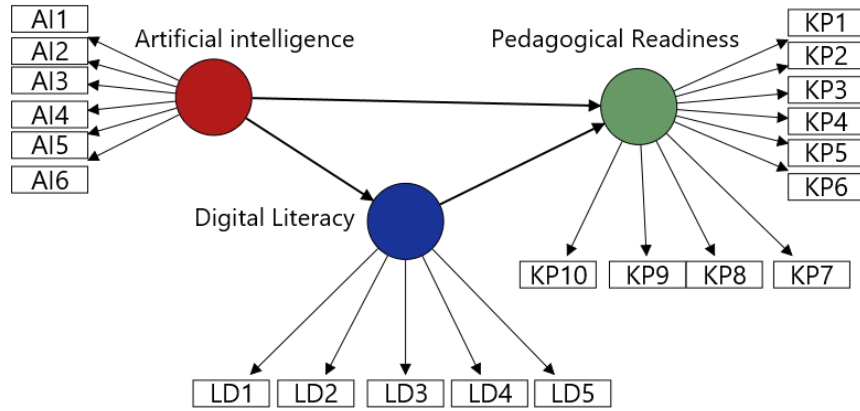


Figure 1. Structural Model SEM-PLS

Figure 1 illustrates that Artificial Intelligence has a positive influence on students' digital literacy and pedagogical readiness. Digital literacy also plays an important role in improving pedagogical readiness, indicating the presence of a mediating relationship within the research model. These findings suggest that the use of AI technology, supported by strong digital literacy skills, can help students become more prepared to understand, design, and implement technology-based learning. In addition, all indicators for each variable were able to adequately represent the research constructs, indicating that the proposed model is appropriate for explaining the relationships among the variables examined in this study

Outer Model

The evaluation of the measurement model was conducted to ensure that each indicator was able to represent the latent constructs validly and reliably. The assessment focused on the values of outer loading, Average Variance Extracted (AVE), and discriminant validity through the HTMT ratio. The results of the outer loading test for each indicator are presented in Table 1. This presentation aims to demonstrate the contribution strength of each indicator in measuring its respective construct.

Table 1. Outer Loading Values

	Artificial intelligence	Digital Literacy	Pedagogical Readiness
AI1	0.887		
AI2	0.865		
AI3	0.888		
AI4	0.847		
AI5	0.808		
AI6	0.859		
KP1			0.822
KP10			0.868
KP2			0.861
KP3			0.866
KP4			0.858
KP5			0.883

KP6	0.852
KP7	0.892
KP8	0.909
KP9	0.889
LD1	0.856
LD2	0.840
LD3	0.860
LD4	0.834
LD5	0.856

Based on Table 1, the outer loading results indicate that all indicators within the Artificial Intelligence, Digital Literacy, and Pedagogical Readiness variables were able to represent their respective constructs effectively. Each indicator consistently and strongly explained the measured variable, thereby meeting the criteria of convergent validity in SEM-PLS analysis. These findings demonstrate that the research instrument was valid and appropriate for measuring the relationships among variables in the proposed model. In addition to evaluating indicator loading strength, the ability of each construct to explain the variance of its indicators also needs to be assessed. Therefore, the Average Variance Extracted (AVE) values are presented in Table 2 as the basis for construct-level evaluation.

Table 2. Average Variance Extracted (AVE)

Average variance extracted (AVE)	
Artificial intelligence	0.738
Digital Literacy	0.722
Pedagogical Readiness	0.757

Based on Table 2, the Average Variance Extracted (AVE) values for all variables indicate that each construct was able to explain the variance of its indicators effectively. These results demonstrate that the Artificial Intelligence, Digital Literacy, and Pedagogical Readiness variables fulfilled the criteria of convergent validity because they strongly represented the research indicators. Therefore, the measurement model in this study can be considered valid and suitable for further analysis. In addition to convergent validity, discriminant validity was also evaluated to ensure conceptual differences among the variables. In this study, discriminant validity was assessed using the Heterotrait-Monotrait (HTMT) ratio, as presented in Table 3.

Table 3. HTMT Values

	Artificial intelligence	Digital Literacy	Pedagogical Readiness
Artificial intelligence			
Digital Literacy	0.734		
Pedagogical Readiness	0.630	0.704	

Based on Table 3, the results indicate that the relationships among variables in the research model are within an acceptable range and do not show any discriminant validity problems. Each construct demonstrates a relevant relationship while still maintaining distinct characteristics from the other variables. These findings confirm that Artificial Intelligence, Digital Literacy, and Pedagogical Readiness are conceptually different constructs, yet they are interconnected in explaining the proposed research model.

Model Fit Evaluation

The overall model fit was evaluated using several goodness-of-fit indices summarized in Table 4. This evaluation aimed to assess the extent to which the proposed model was able to adequately represent the empirical data. Assessing model fit is an important stage before further interpretation of the structural relationships is conducted. Through these indicators, the researcher can ensure that the model demonstrates an acceptable level of statistical and conceptual fit.

Table 4. Model Fit

	Saturated model	Estimated model
SRMR	0.057	0.057
d_ULS	0.739	0.739
d_G	0.617	0.617
NFI	0.847	0.847

Based on Table 4, the goodness-of-fit values indicate that the research model demonstrates a good level of fit between the conceptual model and the empirical data. The results suggest that the SEM-PLS model used in this study was able to adequately explain the relationships among the variables and fulfilled the required model fit criteria. Therefore, the proposed model is considered appropriate for testing the structural relationships and the formulated research hypotheses.

Inner Model

The structural model evaluation was conducted to assess the direction, strength, and significance of the relationships among the latent variables in the research model. This stage was carried out after the measurement model had fulfilled the required validity and reliability criteria. Structural analysis provides the empirical basis for testing the hypotheses formulated in the study. The

complete results of the path coefficient estimation are presented in Table 5 as the foundation for evaluating the causal relationships among the variables.

Table 5. Direct Path Coefficients

	β	STDEV	T	P
Artificial intelligence -> Digital Literacy	0.675	0.106	6.345	0.000
Artificial intelligence -> Pedagogical Readiness	0.288	0.136	2.111	0.017
Digital Literacy -> Pedagogical Readiness	0.467	0.133	3.510	0.000

Based on Table 5, the hypothesis testing results indicate that Artificial Intelligence has a positive and significant effect on both Digital Literacy and Pedagogical Readiness among students. In addition, Digital Literacy was also found to have a positive and significant effect on Pedagogical Readiness. These findings suggest that the utilization of Artificial Intelligence can enhance students' digital literacy skills, which subsequently contribute to improving their pedagogical readiness in technology-based learning. Beyond the direct relationships, the mediating function can be further examined through the mediation path coefficients presented in Table 6.

Table 6. Mediating Path Coefficients

	β	STDEV	T	P
Artificial intelligence -> Digital Literacy -> Pedagogical Readiness	0.315	0.078	4.030	0.000

Based on Table 6, the mediation effect testing results indicate that Digital Literacy is able to positively and significantly mediate the relationship between Artificial Intelligence and Pedagogical Readiness. These findings suggest that the increased use of Artificial Intelligence will be more effective in improving pedagogical readiness when supported by strong digital literacy skills. Therefore, Digital Literacy serves as an important factor that strengthens the influence of Artificial Intelligence on students' pedagogical readiness.

DISCUSSION

The findings indicate that artificial intelligence has a positive and significant effect on digital literacy among second-semester PGMI students at IAIN Curup. This result shows that the increasing use of AI contributes to the improvement of students' ability to access, evaluate, and manage digital information in the learning process. AI supports students in understanding digital technology, searching for information efficiently, and developing technology-based learning skills. Students who frequently use AI tend to demonstrate better competence in utilizing digital media and managing independent learning activities. This finding is consistent with (Yi, 2021), who argued that AI literacy is an essential component of digital competence in the era of technological transformation. AI not only functions as a technological tool but also supports critical thinking and information-processing skills.

This finding also supports (Lin et al., 2025), who reported that AI literacy is closely related to sustainable digital learning and students' practical achievement. The use of AI encourages students to become more active and independent learners. In addition, (Aiyebilehin et al., 2025) explained that digital literacy is an important factor influencing the effective use of AI platforms such as Chat GPT in higher education. Students with stronger AI understanding tend to be more prepared for digital learning challenges. (Zhang & Zhang, 2024) further stated that AI integration in education can strengthen students' digital literacy because it encourages more productive and critical technology use. Therefore, artificial intelligence plays an important role in improving the digital competence of PGMI students as future elementary school teachers.

The results also reveal that artificial intelligence has a positive and significant effect on pedagogical readiness. This finding indicates that AI usage contributes to students' readiness to implement technology-based learning. Pedagogical readiness reflects students' preparedness in understanding instructional strategies, utilizing digital learning media, and managing modern learning environments. Students with better AI competence tend to be more prepared to integrate technology into educational activities. This result is in line with (Fteiha et al., 2025), who found that AI readiness among teachers and pre service teachers is related to knowledge, attitudes, and practices in educational technology use.

(Huang & Zhao, 2025) also reported that AI literacy influences individuals' readiness to adapt to digital educational transformation. AI provides students with more flexible and innovative learning experiences, which subsequently improve pedagogical readiness. Furthermore, (Erol, 2025) explained that AI self-efficacy is closely related to technological pedagogical content knowledge. Students who feel confident in using AI are more capable of developing pedagogical competencies. In this study, PGMI students who were familiar with AI demonstrated better ability to design instructional media, access learning resources, and develop effective learning strategies.

However, the direct effect of artificial intelligence on pedagogical readiness was weaker than its effect on digital literacy. This finding suggests that pedagogical readiness is not influenced solely by AI usage but also by students' digital literacy competence. Digital literacy therefore acts as an important bridge connecting AI utilization with pedagogical readiness. This result supports (Nguyen, 2025), who emphasized that AI-based educational transformation requires the simultaneous strengthening of digital and pedagogical competencies. The implementation of AI without adequate digital literacy may not optimally improve pedagogical readiness. Consequently, higher education institutions should balance AI integration with the enhancement of students' digital literacy skills.

The study further demonstrates that digital literacy has a positive and significant effect on pedagogical readiness. This finding indicates that digital literacy is a major factor in improving students' preparedness for technology-based teaching and learning. Students with higher digital literacy tend to be more capable of using digital learning media, managing technology-supported learning

environments, and developing innovative instructional strategies. Digital literacy enables students to understand and utilize technology effectively within educational contexts. This finding supports (Hu, 2025), who explained that digital competence is strongly associated with readiness for the digital era. Students with strong digital competence generally show greater confidence in using technology for learning purposes.

Similarly, (Maghfiroh et al., 2024) identified digital competence as an important factor in shaping the readiness of future educators in the twenty-first century. Students who are accustomed to using technology tend to possess better abilities in selecting instructional media, preparing digital learning materials, and developing innovative teaching practices. (Rahimi & Tafazoli, 2022) also stated that digital competence positively influences attitudes toward technology integration in higher education. In this study, PGMI students with high digital literacy demonstrated stronger pedagogical readiness in facing AI-based and digital learning environments.

Finally, the findings show that digital literacy significantly mediates the relationship between artificial intelligence and pedagogical readiness. This result indicates that AI utilization becomes more effective in improving pedagogical readiness when students possess strong digital literacy skills. Digital literacy serves as a key mechanism linking AI usage with pedagogical preparedness. Students with high digital literacy are better able to understand AI applications in education and are more prepared to integrate technology into teaching practices.

This finding aligns with (Zhu & Siquan, 2025), who identified AI literacy as an important mediator in enhancing preservice teachers' readiness to use AI. Likewise, (Blancia et al., 2024) emphasized that AI literacy plays a strategic role in preparing individuals for educational technology transformation. Overall, the findings confirm that artificial intelligence, digital literacy, and pedagogical readiness are interconnected factors in shaping PGMI students' readiness for twenty-first-century education. Artificial intelligence enhances students' digital literacy, while digital literacy strengthens pedagogical readiness among future elementary school teachers.

CONCLUSIONS AND RECOMMENDATIONS

The study concludes that Artificial Intelligence has a positive and significant effect on digital literacy and pedagogical readiness among PGMI students at IAIN Curup. The findings also demonstrate that digital literacy positively influences pedagogical readiness. In addition, digital literacy was proven to mediate the relationship between Artificial Intelligence and pedagogical readiness. These results indicate that the use of Artificial Intelligence in learning can improve students' pedagogical readiness when supported by strong digital literacy skills. Students who are capable of understanding, evaluating, and utilizing digital technology effectively tend to be more prepared to design and implement technology-based learning. This study highlights the importance of integrating Artificial Intelligence and strengthening digital literacy in higher education, particularly in teacher education programs within the era of digital transformation.

Based on these findings, higher education institutions are recommended to strengthen digital literacy training programs and the implementation of Artificial Intelligence in learning activities to optimize students' pedagogical readiness. Lecturers are also encouraged to integrate AI-based technologies into teaching practices in a directed and ethical manner. Future studies are suggested to include additional variables such as self-efficacy, technology acceptance, or learning motivation to develop a more comprehensive research model and provide deeper explanations regarding factors influencing students' pedagogical readiness.

FURTHER STUDY

Future studies could extend the present research by examining additional factors that may explain the development of pedagogical readiness among prospective teachers in the context of artificial intelligence and digital transformation. First, future research could incorporate variables such as AI literacy, AI self-efficacy, technological pedagogical content knowledge (TPACK), digital competence, and attitudes toward AI to provide a more comprehensive explanation of pedagogical readiness. Second, researchers could investigate other potential mediating or moderating mechanisms, including self-efficacy, motivation, digital learning environment, institutional support, and experience in using AI, to determine how and under what conditions AI contributes to pedagogical development. Third, future studies could employ longitudinal or experimental designs to examine changes in pedagogical readiness over time and provide stronger evidence regarding the development of readiness following AI-supported learning experiences. Fourth, comparative studies involving students from different teacher education programs, universities, regions, or educational levels could be conducted to examine whether the relationships among AI, digital literacy, and pedagogical readiness vary across educational contexts. Finally, future research could combine quantitative SEM-PLS analysis with qualitative interviews, classroom observations, or mixed-method approaches to obtain deeper insights into how prospective teachers actually use AI and digital technologies when planning, implementing, assessing, and reflecting on learning activities.

ACKNOWLEDGMENT

The authors would like to thank all participants who contributed to this study. Their time, support, and valuable responses made this research possible.

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