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How Digital Literacy Affects AI Literacy Among Preservice Teachers: Media Literacy as a Moderator

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This study explores how digital literacy influences AI literacy among preservice teachers and investigates whether media literacy moderates this relationship. Grounded in the expanding use of AI in education, the study positions digital literacy as a foundational competency that enables effective engagement with AI tools, including their use for teaching, learning, and educational decision-making. Additionally, media literacy—through its emphasis on critical evaluation, reflection on information credibility, and responsible use of digital content—is proposed as a potential moderator of this influence. Data were gathered from 276 teacher candidates from ten universities in Türkiye through a correlational survey design to examine the relationships between digital literacy, media literacy, and AI literacy in an educational context. Findings suggest that digital literacy was a significant predictor of AI literacy, indicating that stronger digital capabilities were associated with higher competence in navigating, understanding, and utilizing AI technologies effectively. Moreover, media literacy was found to moderate this relationship, strengthening the positive effect of digital literacy on AI literacy, potentially by supporting more critical and informed engagement with AI tools. These results suggest that embedding both digital and media literacy within teacher education curricula is essential for fostering AI literacy, enabling future educators to employ AI tools to support teaching and learning.

Introduction

Artificial Intelligence (AI) is widely regarded as one of the most disruptive technologies of the 21st century (Păvăloaia & Necula, 2023). Fundamentally, AI comprises systems capable of emulating human-like mental processes, such as detecting patterns, making choices, and solving complex problems, and performing these tasks in a human-like manner (Kutlucan & Seferoğlu, 2024; Ng et al., 2025). Empowered by these capabilities, AI has begun to exert a transformative impact across diverse sectors, including industry, healthcare, economics, and entertainment, while appearing in everyday practices through applications such as recommendation systems and virtual assistants (Gerlich, 2025; Saihi et al., 2024).

Alongside these fields, AI has also increasingly transformed education (Özüdoğru & Yıldız-Durak, 2025). AI-driven tools now occupy a vital role in supporting individualized

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instruction, streamlining assessment processes, and assisting in the development of learning materials (Chiu et al., 2023; Marengo et al., 2025; Ng et al., 2025; Thomas et al., 2025). These affordances can improve learning outcomes and minimize teaching burdens. However, as AI becomes an integral component of modern life, adapting to an AI-driven world and effectively leveraging these educational advantages requires individuals to possess certain competencies and skills (Karaoğlan-Yılmaz & Yılmaz, 2023; Sperling et al., 2024). This necessity brings the notion of AI literacy to the forefront. AI literacy can be defined as a multifaceted competence through which individuals are able to engage effectively with AI tools, collaborate with AI systems, and critically evaluate the results they produce (Long & Magerko, 2020).

The presence of AI-based instruments and software within academic settings is rapidly expanding, and AI is increasingly shaping pedagogical practices, curriculum design, and educational decision-making (Karaoğlan-Yılmaz et al., 2024; Lee & Kwon, 2024). Consequently, it is crucial for both in-service teachers and preservice teachers, who hold a dual identity as current learners and future educators, to cultivate the competencies necessary for productive engagement with AI in education (Ayanwale et al., 2024). Although AI literacy is important for all individuals seeking to adapt to contemporary AI-driven conditions, for those working in education it is not merely an optional asset but a foundational requirement.

In line with its growing significance, there is a need to identify the variables influence the development of AI literacy. One key factor related to this development is digital literacy. In a broad sense, digital literacy refers to the capacity to access, understand, critique, and produce content utilizing technologies (Avinç & Doğan, 2024). It constitutes a prerequisite competency before individuals can meaningfully learn to use AI tools (Long & Magerko, 2020), as it encompasses the foundational skills that facilitate the development of AI literacy. Moreover, contemporary AI technologies are increasingly embedded within digital products and platforms (Wang et al., 2023), further underscoring the significance of digital literacy in this domain.

Nevertheless, although digital literacy is expected to exert a facilitating influence on AI literacy, this effect may not be uniform; its strength may vary depending on the presence of additional competencies. In this regard, media literacy emerges as a possible moderating variable. Media literacy entails the skills necessary to access and analyze media, thoroughly evaluate media messages, and communicate in diverse contexts (European Commission, 2007). Given the issue of AI hallucinations, in which AI systems may produce inaccurate or fabricated outputs, the emphasis of media literacy on critical thinking becomes particularly relevant (Potter, 2010). Therefore, media literacy may play a moderating role by shaping the process through which individuals' digital literacy is converted into AI literacy.

Based on this reasoning, the research reported here investigates the influence of digital literacy on AI literacy and the extent to which media literacy acts as a moderator in this association. To achieve this objective, the study specifically focuses on preservice teachers, who occupy a dual role as learners and prospective educators, highlighting their importance in influencing educational practices. AI literacy is considered an essential competency for both students and teachers, and preservice teachers—who will integrate AI tools into both their current learning experiences and their future teaching practice—are central to this process. Accordingly, this study offers a more integrated perspective on the literacies required for effective AI integration in education and provides valuable insights for educational initiatives aimed at enhancing AI literacy among preservice teachers.

Conceptual Framework

AI Literacy

Traditionally, literacy was defined as the fundamental abilities of reading and writing (Kong et al., 2021); however, technological advancements have expanded this concept to include various domain-specific competencies (Ng et al., 2021). Within this evolving framework, recent developments in AI (Hackl et al., 2026) have introduced the need for another critical competence: AI literacy (Kandlhofer et al., 2016). As AI systems increasingly mediate everyday decisions, information processing, and professional activities, individuals are now expected to possess the necessary skills to understand and engage with AI tools effectively and responsibly (Sperling et al., 2024). In this sense, AI literacy becomes a vital element of the broader set of new literacies required in a technologically saturated world.

Just as performing tasks in any specialized domain requires domain-relevant knowledge and skills, engaging with AI tools and accomplishing AI-related tasks demands a specific set of abilities. AI literacy encompasses these abilities and is commonly defined as a competence that includes being aware of and understanding AI technologies and their practical applications; being able to utilize AI instruments to accomplish tasks effectively; and being capable of analyzing, selecting, and critically evaluating the data, information, or outputs produced by AI systems (Wang et al., 2023).

Laupicher et al. (2023) evaluate AI literacy through three key components: technical understanding, which denotes the proficiency to comprehend AI technologies from a technical standpoint; critical evaluation, which involves the capacity to rigorously judge AI frameworks and their results; and practical application, which encompasses the expertise needed to apply AI solutions in daily contexts. In a similar vein, Wang et al. (2023) describe AI literacy through four aspects: use, awareness, ethics, and evaluation. These dimensions highlight individuals' competencies in recognizing and understanding AI technologies, utilizing them effectively to accomplish tasks, critically evaluating the quality of AI-generated outputs, and maintaining awareness of the ethical obligations and risks regarding AI use. Considering both viewpoints, it can be inferred that AI literacy is a multidimensional construct extending far beyond technical knowledge alone; it encompasses the practical proficiency in utilizing AI platforms, the critical competence to scrutinize AI outputs, and an informed recognition of the moral duties and prospective dangers inherent in AI systems.

Within the domain of education, the multifaceted nature of AI literacy described above remains equally relevant. In educational contexts, being AI literate goes beyond simply having technical knowledge of AI frameworks; it also includes the proficiency to leverage these tools effectively for educational activities, to assess AI-produced outputs, and gain insight into the ethical implications and possible risks arising from the utilization of AI. Possessing these competencies enables both students and instructors to effectively leverage AI capabilities within educational processes.

Given the importance of AI literacy for students and educators in their educational trajectories, recent scholarly efforts have sought to identify factors that may enhance AI literacy. In this context, studies have examined the roles of various factors in educational settings, including attitudes toward AI (Akca-Sumengen et al., 2025), computational thinking (Celik, 2023), digital competence (Kasinidou et al., 2025), psychological resilience (Ning et al., 2025), and motivational commitment (Kong et al., 2025). While the literature has explored several individual competencies influencing AI literacy, the impact of digital

literacy, which forms the foundation for interacting with digital technologies, warrants specific attention. Accordingly, the next section addresses fundamental aspects of digital literacy and its role in shaping AI literacy.

The Role of Digital Literacy on AI Literacy

Given that digital technologies have become deeply integrated into numerous sectors, digital literacy stands as one of the most essential competencies enabling individuals to function effectively across these domains (Avinç & Doğan, 2024). Digital literacy is viewed as both a core gateway to engagement within an information-based society and an important skill for addressing the challenges of the modern digital era (Anthonysamy et al., 2020; Eshet-Alkalai, 2004). First introduced in the late 1990s by Gilster (1997), the concept refers to an individual's aptitude for securely and effectively accessing, organizing, interpreting, synthesizing, sharing, appraising, and generating information through digital technologies (Law et al., 2018). As this definition suggests, digital literacy extends far beyond mere technological fluency; rather, it encompasses a broad set of information-related practices and actions (Meyers et al., 2013).

As noted above, digital literacy is conceptualized as more than a simple array of technical capabilities; it represents a wide-ranging competence incorporating both intellectual and social-emotional facets. In this regard, Eshet-Alkalai (2004) states that digital literacy involves abilities like interpreting graphical data, creatively producing and reassembling digital content, navigating nonlinear hypertext environments, critically evaluating web-based information, and managing socio-emotional interactions in online settings. Similarly, Ng (2012) highlights the technological, cognitive, and socio-emotional components of digital literacy, emphasizing individuals' capacity to use digital tools effectively, think critically while engaging with information, and behave responsibly in online communication.

When the perspectives of Eshet-Alkalai (2004) and Ng (2012) are considered together, digital literacy appears to encompass core competencies such as technically operating digital tools, navigating online environments effectively, producing digital content, and managing cognitive processes while working with digital information. These competencies provide a foundational digital infrastructure that serves as a prerequisite for individuals to interact with AI systems (Heung et al., 2025; Long & Magerko, 2020). Since AI tools function as digital technologies, individuals are expected to possess basic digital skills, such as operating within digital environments, working with data, and using digital applications, in order to effectively engage with AI tools (Wang et al., 2023). For individuals with insufficient digital literacy, attempting to use AI tools directly may be inefficient and may involve certain risks; therefore, higher levels of digital literacy form a critical basis that strengthens AI literacy. For this reason, individuals with stronger digital literacy are expected to use AI technologies more competently. Accordingly, based on the above discussion, the first hypothesis of this study was proposed as follows:

Hypothesis 1: Digital literacy positively predicts AI literacy.

Media Literacy as a Moderator

In today's world, individuals are surrounded by an overwhelming flow of media, from social media feeds to online news platforms (Koltay, 2011). Under such conditions, the capacity for precise and critical appraisal of media materials has become increasingly vital (Naamati-Schneider & Alt, 2024), which naturally brings media literacy to the forefront

(Erdem et al., 2023). This notion is widely defined by the ability to access, examine, evaluate, and produce media in diverse modalities (Aufderheide, 1993).

A defining feature of a media-literate individual is the strong emphasis on critical thinking. Potter's (2018) media literacy framework clearly demonstrates this emphasis, as it consists of skills such as analysis, grouping, evaluation, induction, deduction, abstracting, and synthesis, each of which relies on advanced cognitive processes rooted in critical thinking. These skills require individuals to deconstruct media messages, critically question their validity, detect patterns, generalize information, and reorganize meaning. Similarly, Aufderheide's (1993) definition highlights analysis and evaluation as core components, both of which inherently point to critical inquiry. Scholars have likewise consistently described critical thinking as the core component of media literacy (Musi et al., 2022).

The central role of critical thinking in media literacy provides a compelling explanation for its moderating function between digital literacy and AI literacy. Using AI systems inherently involves engaging with their outputs, which may at times contain inaccuracies, fabricated information, or misleading content due to phenomena such as AI hallucinations (Christensen et al., 2025; Sun et al., 2024). In addressing such misinformation risks, the critical perspective afforded by media literacy functions as a necessary filter (Hameleers, 2022). Media literacy enables individuals to determine whether AI-produced messages are accurate and credible (von Gillern et al., 2024). Therefore, the degree to which digital literacy contributes to AI literacy may depend on individuals' level of media literacy. In this regard, individuals with high media literacy can leverage their digital skills to engage with AI tools more analytically and cautiously, thereby strengthening the positive influence of digital literacy on AI literacy. Conversely, individuals with low media literacy may use AI tools only at a mechanical level; yet because they lack critical capabilities such as content verification, bias detection, or contextual assessment, the potential of digital literacy to contribute to AI literacy is likely to remain more limited. In light of the foregoing discussion, the second hypothesis presented below was developed:

Hypothesis 2: Media literacy moderates the predictive relationship between digital literacy and AI literacy.

Significance of the Study

The rapid deployment of AI tools within pedagogy, communication, and everyday problem-solving has made the capability to skillfully employ and evaluate these tools a significant competence. As AI systems increasingly shape learning, production, and decision-making processes, identifying the factors that foster AI literacy has become both theoretically and practically significant. In this context, examining the influence of digital literacy, a foundational competence of the digital age, on AI literacy addresses a key gap in the literature, given that empirical studies exploring this relationship remain limited (Seker et al., 2025; Wang et al., 2023).

What sets this study apart is its dual focus: it explores the direct link between digital and AI literacies while simultaneously investigating the moderating influence of media literacy. Contemporary AI systems frequently generate media-like outputs, whether informative, persuasive, visual, or textual in nature, which may at times be inaccurate or misleading (Christensen et al., 2025), raising important concerns regarding information reliability. This underscores the unique function that media literacy has in framing individuals' interpretation of and interaction with AI-generated content (Hwang & Jeong, 2025). Yet, to date, no studies

have examined whether media literacy moderates the relationship between digital and AI literacies, positioning the present research as an original addition to the literature.

The study also aims to provide meaningful practical implications. As AI tools become more deeply integrated into learning environments, learners must not only use these systems technically but also critically evaluate their outputs for accuracy, bias, and reliability. By emphasizing both technical competencies from digital literacy and critical-evaluative skills from media literacy, this research is expected to offer a more nuanced framework for effective AI literacy development. Considering these complementary competencies together is believed to promote safer, more informed use of AI, particularly in addressing risks such as misinformation, biased outputs, and hallucinations, which are often overlooked in existing studies.

Another important aspect of the study is its focus on preservice teachers, who occupy a unique position within the educational ecosystem as both current learners and future educators. These individuals already employ AI tools in their academic work and will increasingly rely on such technologies in instructional design, assessment, and classroom practices. Enhancing their AI literacy is therefore vital for both present learning processes and future professional competence. In this context, digital literacy equips preservice teachers with technical competencies needed to use AI technologies successfully, while media literacy helps them carefully assess AI-created outputs before incorporating them into instruction. By simultaneously addressing these two complementary dimensions, the study highlights a distinctive and underexplored pathway for developing AI literacy in teacher education.

Overall, this research offers both theoretical and practical contributions by introducing a new model that integrates digital literacy and media literacy to explain AI literacy, and by providing actionable insights for efforts to strengthen AI literacy, particularly within preservice teacher education.

Method

Research Design

To investigate the impact of digital literacy on AI literacy and the moderating function of media literacy, a correlational survey design was employed (see Figure 1). This design represents a quantitative inquiry that seeks to determine the presence and strength of associations among multiple variables.

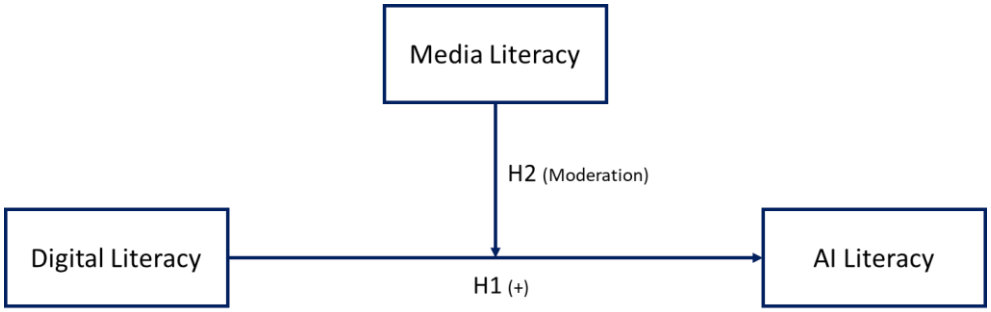

Figure 1. Research model

Participants

In 2025, the study included 276 preservice teachers from ten universities in Türkiye, selected through convenience sampling on a voluntary basis. Using G*Power 3.1.9.7, an a priori power analysis was performed to determine whether the number of participants was adequate for multiple regression analysis (Faul et al., 2007). The calculation was performed based on an alpha level of 0.05, a medium effect size of 0.15, and a statistical power of 0.95 (Cohen, 1988). The model included three predictors (independent variable, moderator, and their interaction), indicating a minimum required sample size of 119. The actual sample of 276 participants is well above this requirement, ensuring sufficient statistical power for detecting the moderation effect.

Among the participants, 209 identified as female and 67 as male. The preservice teachers were distributed across nine academic programs. The largest groups came from Elementary Mathematics Education (n = 58, 21.0%), Guidance and Psychological Counseling (n = 51, 18.5%), and Special Education (n = 49, 17.8%). These were followed by German Language Teaching (n = 31, 11.2%), English Language Teaching (n = 33, 12.0%), Social Studies Education (n = 17, 6.2%), Turkish Language Teaching (n = 17, 6.2%), Computer Education and Instructional Technology (n = 16, 5.8%), and Classroom Teaching (n = 4, 1.4%). In terms of grade levels, participants were distributed as follows: first-year students (n = 61, 22.1%), second-year students (n = 178, 64.5%), third-year students (n = 13, 4.7%), and fourth-year students (n = 24, 8.7%).

Data Collection Tools

Personal Information Form

Participant characteristics, such as gender, university, academic program, and year of study, were obtained through this form, designed by the researcher.

Artificial Intelligence Literacy Scale

This scale was employed to assess preservice teachers' AI literacy, with the original version developed by Wang et al. (2023) and the Turkish adaptation provided by Uğraş et al. (2024). The scale has 12 items and 4 sub-dimensions (awareness, use, evaluation, and ethics), rated on a 5-point Likert scale. Cronbach's alpha coefficient was reported as 0.86, while the value obtained in this study was 0.81. These values indicate that the scale demonstrates acceptable internal reliability (Nunnally, 1994). Adapted version of the scale has been validated for use with preservice teachers, confirming its relevance and suitability for this target population.

Digital Literacy Scale

This instrument was used to evaluate preservice teachers' digital literacy, with the original instrument proposed by Ng (2012), and the Turkish carried out by Üstündağ et al. (2017). The scale is unidimensional and comprises 10 items rated on a 5-point Likert scale. The original Cronbach's alpha coefficient was 0.86; in this study, the coefficient was calculated as 0.90, indicating a high level of internal reliability (Nunnally, 1994). The Turkish adaptation has been specifically validated for preservice teachers, supporting its appropriateness for assessing digital literacy in this population.

Media Literacy Level Determination Scale

Karaman and Karataş (2009) developed this scale, which was utilized in this study to assess preservice teachers' media literacy. The scale includes 17 items and 3 sub-dimensions (being knowledgeable, analyzing and reacting, judging and being aware of implicit messages), rated on a 5-point Likert scale. The original Cronbach's alpha coefficient was reported as 0.84, while the reliability coefficient obtained in this study was 0.93, indicating a high level of internal reliability (Nunnally, 1994). As the scale was originally developed for preservice teachers, its content and structure are directly aligned with the study's target population.

Data Collection Procedure

The ethical approval for this research was provided by the ethics committee of the researcher's affiliated institution (Date: 23.05.2025; Approval No: 2025/90). The study employed a fully anonymous survey design and posed minimal risk to participants. Informed consent was secured from all individuals before taking part in the study. Data were collected through both online and paper-based questionnaires. Before starting the survey, all students were explicitly briefed on the research objectives, their voluntary participation, and their option to exit the study without facing any repercussions. For the online questionnaires, students received the survey link. Paper-based questionnaires were distributed only to students who agreed to participate voluntarily, and to avoid any potential pressure, they were delivered by colleagues rather than the researcher. Students completed the forms independently and returned them, and the researcher collected all completed questionnaires afterward. No personally identifiable data were recorded; all information was used solely for research purposes.

Data Analysis

Initially, the data collected through paper-based questionnaires were transferred into electronic format. After all responses were compiled and organized in Microsoft Excel, the dataset was imported into the statistical software (IBM SPSS, ver. 27). A simple linear regression was performed to investigate how digital literacy among preservice teachers predicts their AI literacy levels. Prior to the analysis, all relevant assumptions were checked.

To identify potential outliers, Cook's distance values were examined, yielding a range between 0.00 and 0.19. Since all values were below the threshold of 1, no influential outliers were detected (Cook & Weisberg, 1982). Coefficients of skewness and kurtosis were within the ±1.5 interval, which means that the normality assumption was satisfied (Tabachnick & Fidell, 2013). Linearity and homoscedasticity were evaluated through the scatterplot presented in Figure 2, which indicated that the two assumptions were satisfied. Moreover, a Durbin-Watson coefficient of 1.91 was recorded, which sits within the recommended 1.5 to 2.5 interval, indicating no autocorrelation issues in the data.

Additionally, the moderating role of media literacy was examined using Hayes' (2022) PROCESS macro (ver. 4.2), installed as an add-on to SPSS and employed for the moderation analysis. For this analysis, multicollinearity was also assessed. The findings revealed a tolerance value of 0.694 (exceeding the 0.10 limit) and a variance inflation factor (VIF) of 1.441 (remaining well under 10.0), confirming that multicollinearity was not a concern.

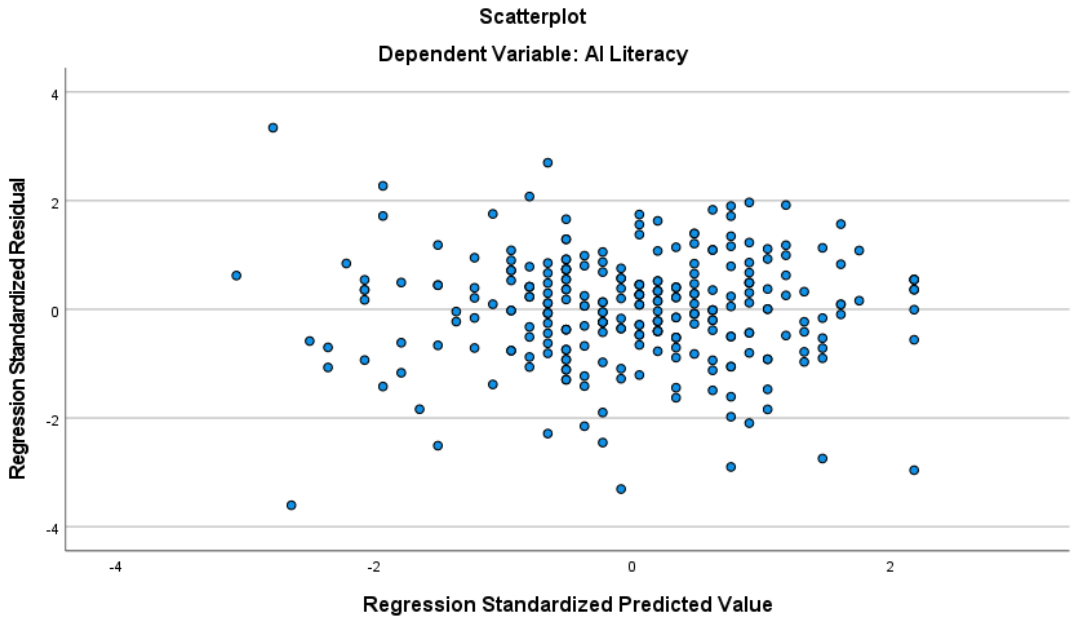

Figure 2. Scatterplot for checking linearity and homoscedasticity

Findings

Descriptive Statistics

Table 1 provides basic statistical summaries of the study variables.

Table 1. Descriptive statistics of variables

Variables	M	SD	Skewness	Kurtosis	Intercorrelations		
					1	2	3
1. AI Literacy	3.69	0.58	-0.47	1.14	---		
2. Digital Literacy	3.46	0.70	-0.28	0.23	0.64**	---	
3. Media Literacy	3.62	0.63	-0.66	1.37	0.50**	0.55**	---

** Significance at the 0.01 level

According to Pimentel's (2010) classification criteria, participants demonstrated high levels of AI literacy (M = 3.69, SD = 0.58), digital literacy (M = 3.46, SD = 0.70), and media literacy (M = 3.62, SD = 0.63). Examination of the correlations revealed that AI literacy was strongly and positively associated with digital literacy (r = 0.64) and moderately and positively associated with media literacy (r = 0.50). Furthermore, a positive association was observed between digital and media literacies (r = 0.55). All identified correlations achieved statistical significance at the 0.01 level, reflecting robust and consistent associations between the constructs under study.

Digital Literacy as a Predictor of AI Literacy (H1)

A simple linear regression was performed to evaluate the degree to which digital literacy serves as a predictor for AI literacy, with the corresponding data displayed in Table 2.

Table 2. Regression coefficient for the direct effect of digital literacy on AI literacy

Variable	*B*	Std. Error *(B)*	*β*	*t*	*p*
(Constant)	1.867	0.136		13.692	< 0.001
Digital Literacy	0.527	0.039	0.636	13.646	< 0.001

$r = 0.64$ $R^2 = 0.41$ $F_{(1, 274)} = 186.224$ $p = 0.000$ $D\text{-}W = 1.91$

The statistical outputs in Table 2 reveal that the regression model achieved significance ($F_{(1,274)} = 186.224$, $p < 0.001$). The model accounted for 41% of the total variance in AI literacy ($R^2 = 0.41$), establishing digital literacy as a strong predictor of AI literacy. Consequently, H1 was supported.

Moderating Effect of Media Literacy on The Relationship Between Digital Literacy and AI Literacy (H2)

To examine whether media literacy moderates the relationship between digital literacy and AI literacy, Hayes' PROCESS Macro (Model 1) was employed. The results are presented in Table 3.

Table 3. Moderated regression model predicting AI literacy

Variables	*B*	SE	*t*	*p*	LLCI	ULCI
(Constant)	3.663	0.029	128.536	< 0.001	3.607	3.719
Digital Literacy (DL)	0.425	0.045	9.458	< 0.001	0.336	0.513
Media Literacy (ML)	0.213	0.051	4.211	< 0.001	0.113	0.312
DL × ML	0.114	0.045	2.541	0.012	0.026	0.202

r = 0.669 $R^2 = 0.448$, $F_{(3, 272)} = 73.452$, $p<0.001$ $\Delta R^2 = 0.013$, $F_{(1, 272)} = 6.458$ $p = 0.012$

According to Table 3, the overall model was significant (r = 0.669; $R^2 = 0.448$; $F_{(3,272)} = 73.452$, $p < 0.001$). The interaction between digital literacy and media literacy was also found to be significant (B = 0.114, SE = 0.045, t = 2.541, p = 0.012, 95% CI [0.026, 0.202]), which confirms the moderating role of media literacy. The addition of the interaction term led to a meaningful growth in the variance explained ($\Delta R^2 = 0.013$, $F_{(1,272)} = 6.458$, p = 0.012). These results indicate that the strength of the link between digital literacy and AI literacy varies depending on individuals' media literacy levels, thus supporting H2.

To further interpret the nature of this interaction, the conditional effects of digital literacy on AI literacy were examined at low, mean, and high levels of media literacy (see Table 4).

Table 4. Conditional effects of digital literacy on AI literacy at different levels of media literacy

Level of ML	B	SE	*t*	*p*	LLCI	ULCI
Low (-0.621)	0.354	0.054	6.515	< 0.001	0.247	0.461
Mean (0.026)	0.428	0.045	9.536	< 0.001	0.340	0.516
High (0.595)	0.493	0.051	9.703	< 0.001	0.393	0.593

As illustrated in Table 4, the impact of digital literacy on AI literacy was significant at all levels of media literacy. At low media literacy, the relationship was positive (B = 0.354, SE = 0.054, t = 6.515, p < 0.001, 95% CI [0.247, 0.461]). This effect increased at the mean level of media literacy (B=0.428, SE=0.045, t=9.536, p < 0.001, 95% CI [0.340, 0.516]) and became even stronger at high media literacy (B = 0.493, SE = 0.051, t = 9.703, p < 0.001, 95% CI [0.393, 0.593]). These conditional effects demonstrate that media literacy amplifies the positive effect of digital literacy on AI literacy, suggesting that preservice teachers with higher levels of media literacy derive greater benefit from their digital skills in predicting AI

literacy (see Figure 3).

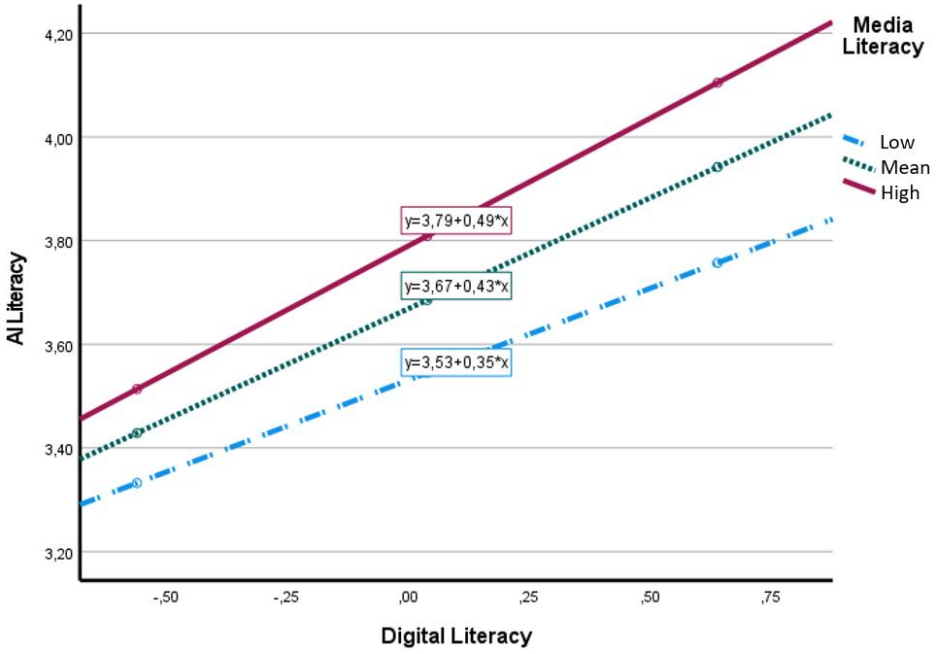

Figure 3. Interaction effect of digital literacy and media literacy on AI literacy

Discussion

In the present study, the predictive role of preservice teachers' digital literacy on AI literacy and the moderating role of media literacy were examined. The findings regarding these two relationships are presented under separate subheadings to facilitate clarity and ease of comprehension.

Effect of Digital Literacy on AI Literacy

Beginning with the first hypothesis, it was found that preservice teachers' digital literacy levels significantly predicted their AI literacy. Specifically, digital literacy accounted for a substantial 41% of the variance in AI literacy. Limited existing studies in the literature, although not conducted specifically in the context of preservice teachers, have similarly reported a significant impact of digital literacy on AI literacy (Seker et al., 2025; Wang et al., 2023).

Several factors may explain why digital literacy exerts a significant influence on AI literacy. Digital literacy broadly entails the ability to effectively use computers, the internet, and various digital applications (Makhafola et al., 2025). Given that contemporary AI tools operate via digital platforms, individuals equipped with a foundational set of digital skills are better prepared to interact with these technologies (Wang et al., 2023). For instance, preservice teachers using language model-based tools such as ChatGPT must know how to enter text and experiment with different prompts. Similarly, AI-based image generation tools require users to navigate the interface, access the platform, and save outputs, all of which rely on basic digital skills. AI tools for data analysis or instructional material preparation also demand competencies such as uploading files, creating tables or charts, and interpreting outputs. These examples illustrate that digital literacy skills constitute a necessary precondition for effective and efficient engagement with AI tools (Du, 2025; Joseph et al., 2024). In addition, a study found that preservice teachers with greater digital literacy reported

feeling less anxious about AI (Ayduğ & Altınpulluk, 2025). Reduced anxiety may facilitate greater willingness to experiment with and use AI tools, fostering an environment supportive of the enhancement of AI literacy.

Another factor underlying the strong contribution of digital literacy to AI literacy is its association with attitudes toward AI tools and their intended use. The literature supports this link: for example, Abuadas and Albikawi (2025) reported that digital literacy serves as a key determinant of individuals' intention to use AI. Similarly, other studies suggest that digital literacy has a significant impact on AI usage intentions (Du, 2025) and AI adoption (Huang & Derakhshan, 2025). Individuals with stronger intentions to use AI are likely more open to exploring and learning these tools, which in turn may accelerate AI literacy development. Consequently, digital literacy may contribute to preservice teachers' AI literacy indirectly by enhancing their intention and readiness to use AI tools. In line with this, Ng (2012) emphasizes that individuals with higher digital literacy adapt more readily to new technologies and the skills required in the digital age, thereby facilitating a faster transition to "new literacies", AI literacy in this context.

The Moderating Role of Media Literacy

Building on the finding that digital literacy predicts AI literacy, the second hypothesis of this study aimed to examine whether this relationship varies across different levels of media literacy. The results suggest that media literacy functions as a moderator in the relationship between AI literacy and digital literacy. Specifically, the analyses indicate that the impact of digital literacy on AI literacy differs depending on individuals' media literacy levels. As media literacy increases, the positive impact of digital literacy on AI literacy is further amplified. Although a small body of research has explored this relationship, no prior research has examined how media literacy moderates it. Therefore, it was not possible to directly contextualize the present findings within the existing literature.

A closer look at why media literacy strengthens this relationship suggests that the critical thinking skills at the core of the concept are likely to play a decisive role (Al-Zou'bi, 2021; Potter, 2010). Effective use of AI tools requires users to formulate clear, purposeful prompts and subsequently evaluate the system's responses. However, AI systems, by design, do not typically reflect uncertainty; instead, they tend to produce confident outputs in virtually every case (Zhang et al., 2024; Zhou et al., 2024). This tendency calls into question the accuracy, coherence, and validity of the information created (Ou et al., 2024). Thus, this problem, frequently discussed in the literature as AI hallucination, necessitates that individuals subject AI-generated content to critical scrutiny rather than accepting it without question, a capacity closely linked to one's level of media literacy (Das et al., 2025).

While digital literacy is undoubtedly essential for using AI systems, as noted above, the potential for AI to generate incorrect or fabricated information cannot be overlooked. Because this risk requires a critical evaluative stance, media literacy emerges as a crucial element in reinforcing the transformation of digital skills into AI literacy (Erdem et al., 2023). In this context, an individual with low media literacy may possess adequate digital competencies and use AI systems effectively in a technical sense, yet still trust AI-generated outputs uncritically, which suggests insufficient AI literacy. Conversely, high media literacy enables individuals to situate their digital skills within a more conscious, critical, and evaluative framework, thereby supporting more competent engagement with AI systems (Orhan, 2023). In this respect, media literacy serves as a facilitating mechanism for preservice teachers,

providing a framework that supports the translation of digital skills into AI literacy. Accordingly, it emerges as a key moderator that strengthens the link between digital literacy and AI literacy.

Concluding Remarks

AI has become an established part of contemporary education, making it essential for individuals to adapt and develop the necessary competencies. Preservice teachers are uniquely positioned at the crossroads of learning and future teaching responsibilities, which makes their AI literacy particularly critical. Building a broader culture of AI literacy within society may be supported primarily through education, and teachers serve as important agents capable of driving this transformation (Dehen et al., 2026). Strengthening AI literacy during the preservice period lays the foundation for equipping future teachers who will, in turn, influence the AI competencies of their students (Lademann et al., 2026). From a macro-level perspective, initiatives designed to enhance preservice teachers' AI literacy, taking into account their digital and media literacy, play an important role in developing an AI-literate society over time. Moreover, considering the ways AI is transforming professions, individuals who can effectively utilize AI tools may be better positioned in the job market, making it even more crucial to nurture AI-literate educators. Ultimately, AI literacy is becoming increasingly important for individuals across various domains, but its dissemination across society depends heavily on preparing preservice teachers who can serve as catalysts for long-term societal impact.

Practical Recommendations

Translating the findings of this study into practical recommendations requires formulating actionable strategies. Therefore, to support preservice teachers in engaging with technology in future educational settings more consciously, critically, and effectively, this study outlines several practical recommendations derived from the current findings.

First, given that digital literacy explained approximately 41% of the variance in AI literacy, teacher education curricula should prioritize strengthening digital literacy skills to ensure a solid basis for preservice teachers' AI literacy. In this regard, instructional activities aimed at enhancing students' digital competencies, such as the applied use of digital tools, comprehending the underlying logic of these tools, digital content creation, and troubleshooting, may be incorporated. Additionally, programs may include activities to enhance AI literacy. These may involve hands-on tasks in which preservice teachers work with AI tools, such as prompt-design activities, analytical exercises comparing AI outputs for accuracy and coherence, and classroom-based scenarios requiring the evaluation of the pedagogical appropriateness of AI tools.

Second, as the contribution of digital literacy to AI literacy was found to be stronger at higher levels of media literacy, this suggests that strengthening preservice teachers' media literacy should also be a curricular priority. Accordingly, curricula should incorporate media literacy training that addresses issues such as misinformation, algorithmic biases, and AI hallucinations. Case-based discussions, fact-checking exercises, and reflective activities centered on AI-generated errors may serve as effective strategies to enhance preservice teachers' critical capacities and support the development of robust media literacy.

Limitations and Future Directions

Even though the current study has offered valuable insights on AI literacy, it is essential to recognize certain limitations. First, one limitation of the research is the dependence on a cross-sectional methodology, which hinders firm conclusions regarding causality. While the findings indicate that digital literacy significantly predicts AI literacy and that media literacy moderates this effect, longitudinal or experimental studies are required to capture the dynamics of these relationships across time.

Although the current sample was adequate for the statistical procedures, it may still be considered a limitation in relation to the generalizability of the results. Moreover, the gender distribution among participants was somewhat unbalanced, with a higher proportion of female preservice teachers compared to male, which may reduce the generalizability of the outcomes across genders. Therefore, future investigations should target a broader, more balanced sample of preservice teachers which represents a wider range of departments, class levels, institutions and gender groups.

Another limitation relates to the use of self-reported measures. Such an approach presents a risk of social desirability bias, where individuals might provide answers that align with perceived social norms (Nederhof, 1985). To mitigate this concern, future studies would benefit from incorporating performance-based assessments or mixed-method approaches, including interviews or task-based evaluations.

Finally, considering that digital literacy has only been minimally examined in the context of AI literacy—and that the moderating role of media literacy has not been explored prior to this study—future research should revisit these variables. Re-examining both constructs across different contexts and populations would foster a more nuanced and thorough grasp of their specific contributions to the development of AI literacy.

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