

Digital Literacy and Institutional Support as Determinants of AI Usability among Social Studies Pre-Service Teachers in Colleges of Education in Oyo State

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Abstract

This study investigates the predictive roles of digital literacy and institutional support in AI usability among social studies pre-service teachers in Colleges of Education in Oyo State. A correlational survey research design adopted, involving 310 randomly selected pre-service teachers from two public Colleges of Education. Three instruments—Pre-service Teachers' Digital Literacy Scale (PTDLS), Institutional Support Scale (PTISS), and AI Usability Scale (PTAIS)—were used, with reliability coefficients of 0.82, 0.79, and 0.84, respectively. Data analysis employed descriptive statistics, Pearson correlation, and multiple regression. Findings showed a significant positive relationship between digital literacy and AI usability ($r = 0.438, p < 0.05$) and between institutional support and AI usability ($r = 0.462, p < 0.05$). Both variables jointly accounted for 57% of the variance in AI usability ($R^2 = 0.57, F = 58.72, p < 0.01$). Digital literacy ($\beta = 0.49, p < 0.01$) had a slightly stronger predictive influence than institutional support ($\beta = 0.44, p < 0.01$). The study underscores the need for enhanced digital literacy training and institutional support to improve AI usability in teacher education. It recommends targeted training and policies to strengthen digital competencies and institutional frameworks for AI integration in Colleges of Education.

Keywords: Digital literacy, Institutional support, AI usability, Pre-service teachers

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Introduction

The integration of artificial intelligence (AI) in education has transformed teaching and learning methodologies, offering innovative solutions to enhance instructional delivery and student engagement. AI applications, such as adaptive learning systems, automated assessment tools, and intelligent tutoring systems, are increasingly being incorporated into teacher education to improve pedagogical outcomes. In the context of pre-service teacher training, AI has the potential to personalise learning, facilitate digital resource management, and enhance instructional design. However, while AI adoption is gaining momentum globally, its usability among social studies pre-service teachers remains largely underexplored. Social studies as a discipline plays a fundamental role in fostering civic consciousness, social responsibility, and critical thinking skills, making AI integration particularly relevant. Despite these advantages, the extent to which social studies pre-service teachers can effectively engage with AI tools is influenced by multiple factors, including their level of digital literacy and the support they receive from their institutions.

A critical determinant of AI usability in teacher education is digital literacy, which encompasses the ability to access, evaluate, and utilise digital technologies effectively. Digital literacy is fundamental to AI adoption, as it enables pre-service teachers to interact with AI-powered educational tools and integrate them into their teaching practices (Hinojo-Lucena *et al.*, 2019). Research has shown that pre-service teachers with high levels of digital literacy are more likely to explore AI-based instructional strategies, thereby enhancing their pedagogical competencies (Redecker & Punie, 2017). Conversely, those with low digital literacy often face challenges in navigating AI tools, which limits their engagement with technology-driven teaching methodologies (Crompton *et al.*, 2021). While previous studies have focused on general digital competence among educators (Tondeur *et al.*, 2018), there is a scarcity of research that specifically examines how digital literacy influences AI usability among social studies pre-service teachers, highlighting the need for targeted investigations in this area.

Beyond individual competence, institutional support plays a crucial role in fostering AI adoption in teacher education. Institutional support includes access to technological infrastructure, professional development programmes,

and policy frameworks that facilitate the integration of AI in teaching and learning (Zhao *et al.*, 2021). Studies have established that educational institutions that prioritise digital transformation by providing AI training workshops, funding for technology acquisition, and supportive learning environments enhance pre-service teachers' confidence and willingness to engage with AI tools (García-Peñalvo *et al.*, 2021). In contrast, inadequate institutional support, such as a lack of digital resources and insufficient AI-focused training, hinders technology adoption among pre-service teachers (Ifenthaler & Schumacher, 2020). While these findings underscore the importance of institutional support in digital education, existing literature has not sufficiently addressed its impact on AI usability among social studies pre-service teachers in Nigerian Colleges of Education. This gap necessitates further empirical inquiry into how institutional factors shape AI adoption in social studies education.

Despite the increasing emphasis on AI-driven education, there remains a significant research gap regarding its usability among social studies pre-service teachers in Nigeria. Most studies on AI adoption in education have focused on science, technology, engineering, and mathematics (STEM) disciplines (Hinojo-Lucena *et al.*, 2019), with limited attention given to social sciences education. Furthermore, while existing research has examined digital literacy and institutional support as individual predictors of technology adoption, their combined influence on AI usability remains underexplored (Mousavizadeh *et al.*, 2021). Addressing this gap is essential for developing comprehensive strategies to enhance AI integration in teacher education, particularly in non-STEM disciplines where digital transformation efforts have been relatively slow.

By examining digital literacy and institutional support as determinants of AI usability, this study contributes to the growing discourse on digital transformation in higher education. It provides empirical insights into how these factors collectively influence pre-service teachers' ability to integrate AI into their pedagogical practices. Unlike previous studies that have treated digital literacy and institutional support in isolation, this research adopts a holistic approach to understanding AI usability in teacher education. The findings will be instrumental in informing policymakers, educators, and curriculum developers on strategies to enhance AI adoption in Colleges of

Education, ultimately improving the quality of teacher preparation and instructional delivery in social studies.

Statement of the Problem

The integration of artificial intelligence (AI) in teacher education has become increasingly important for enhancing pedagogical practices and student engagement. However, the usability of AI tools among social studies pre-service teachers in Colleges of Education in Oyo State remains limited. Despite the transformative potential of AI, many pre-service teachers lack the digital literacy required to effectively utilise AI technologies, and institutional support in terms of infrastructure, training, and policy remains inadequate. While existing studies have examined digital literacy and institutional support separately in the context of technology adoption, there is a paucity of research exploring how these factors jointly influence AI usability in non-STEM disciplines such as social studies. This gap presents a challenge to effective AI integration in teacher education, thereby hindering efforts to improve the quality of social studies instruction through digital innovation.

Objectives

The aim of this study is to investigate the influence of digital literacy and institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State. The specific objectives are to:

- I. Determine the impact of digital literacy on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.
- II. Examine the effect of institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.
- III. Assess the combined influence of digital literacy and institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.

Hypotheses

The following null hypotheses will be tested in this study:

- I. There is no significant relationship between digital literacy and AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.
- II. There is no significant relationship between institutional support and AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.
- III. There is no significant combined influence of digital literacy and institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.

Methodology

This study adopted the survey research design of the correlational type to investigate the predictive roles of digital literacy and institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State. The research aimed to understand how digital literacy and institutional support contribute to pre-service teachers' ability to effectively engage with AI tools in their academic activities.

The population for the study comprised all social studies pre-service teachers in two public Colleges of Education in Oyo State. All public Colleges of Education in the state were purposively selected to ensure comprehensive coverage and allow for a large sample of respondents. A simple random sampling technique was used to select all year-three social studies pre-service teachers, considering their exposure to technology-based learning and AI applications. A total of 310 pre-service teachers participated in the study, distributed across two Colleges of Education in the state: College of Education, Lanlate (79) and Federal College of Education (Special), Oyo (231).

Three self-designed instruments were used for data collection in this study:

- I. Pre-service Teachers' Digital Literacy Scale (PTDLS)
- II. Pre-service Teachers' Institutional Support Scale (PTISS)
- III. Pre-service Teachers' AI Usability Scale (PTAIS)

The PTDLs was a self-designed instrument containing 12 items to assess digital literacy among pre-service teachers. It consisted of two sections: Section A, which collected demographic details such as Name of College and Sex, and Section B, which included 10 Likert-type items on a 4-point scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). Positive statements were scored 4, 3, 2, and 1, respectively, while the scoring was reversed for negative statements. The instrument underwent peer and expert review to establish its content validity.

The PTISS was also developed by the researcher to assess institutional support for AI usability among pre-service teachers. This scale comprised two sections: Section A, containing demographic information, and Section B, which included 10 Likert-type items with the same scoring pattern as the PTDLs. Positive statements were scored 4, 3, 2, and 1, while negative statements were scored in reverse. The instrument was also validated by peers and experts.

The PTAIS was a self-designed instrument with 10 items aimed at measuring the level of AI usability among pre-service teachers. The scale consisted of two sections: Section A, which included demographic details, and Section B, consisting of 10 Likert-type items designed to assess the knowledge, attitudes, and behaviours essential for AI usability. The scoring followed the same 4-point Likert scale pattern as the previous instruments.

To ensure reliability, a pilot study was conducted with 30 pre-service teachers who were not part of the main study sample. The internal consistency of the instruments was determined using Cronbach's alpha coefficient. The PTDLs yielded a reliability coefficient of 0.82, the PTISS had a reliability coefficient of 0.79, and the PTAIS had a reliability coefficient of 0.84. These values indicated that the instruments were reliable for measuring digital literacy, institutional support, and AI usability. In addition to reliability, the validity of the instruments was established through expert review. The instruments were subjected to face and content validation by specialists in educational technology and measurement and evaluation, who examined the items for clarity, relevance, and appropriateness in measuring the intended constructs. Their suggestions and corrections were incorporated before the final administration of the instruments.

The data for the study were collected through the administration of structured questionnaires to the selected pre-service teachers. Copies of the questionnaire

were distributed personally by the researcher with the assistance of trained research aides, and respondents were given adequate time to complete them. All completed questionnaires were retrieved immediately to ensure a high response rate. The data collected from the administered instruments were analyzed using both descriptive and inferential statistics. Descriptive statistics, including frequency counts and percentages, were used to present the characteristics and responses of the participants. Inferential statistics, such as Pearson Product-Moment Correlation Coefficient and Multiple Regression Analysis, were employed to determine the relationships between the independent variables (digital literacy and institutional support) and the dependent variable (AI usability). All hypotheses were tested at a 0.05 level of significance.

Result

Hypothesis 1: There is no significant relationship between digital literacy and AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.

Table 1: Summary of Pearson Product Moment Correlation on the Relationship Between Digital Literacy and AI Usability Among Social Studies Pre-service Teachers in Colleges of Education in Oyo State

Variable	N	Mean	SD	DF	R	Sig.	Remark
Digital Literacy	310	3.18	0.95	308	0.438*	0.000	Significant
AI Usability	310	3.12	0.92				

Correlation is significant at the 0.05 level (2-tailed).

Table 1 presents the Pearson correlation between digital literacy and AI usability among social studies pre-service teachers in Oyo State. The positive correlation ($r = 0.438$, $p < 0.05$) indicates a significant relationship, suggesting that higher digital literacy enhances AI usability. Thus, the null hypothesis is rejected.

Hypothesis 2: There is no significant relationship between institutional support and AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.

Table 2: Summary of Pearson Product Moment Correlation on the Relationship Between Institutional Support and AI Usability Among Social Studies Pre-service Teachers in Colleges of Education in Oyo State

Variable	N	Mean	SD	DF	R	Sig.	Remark
Institutional Support	310	3.22	0.93	308	0.462*	0.000	Significant
AI Usability	310	3.12	0.92				

Correlation is significant at the 0.05 level (2-tailed).

Table 2 presents the Pearson correlation between institutional support and AI usability among social studies pre-service teachers in Oyo State. The positive correlation ($r = 0.462$, $p < 0.05$) indicates a significant relationship, suggesting that greater institutional support enhances AI usability. Thus, the null hypothesis is rejected.

Hypothesis 3: There is no significant combined influence of digital literacy and institutional support on AI usability among social studies pre-service teachers in Colleges of Education in Oyo State.

Table 3: Joint Multiple Regression Model Summary

Model Statistic	Value
R ²	0.57
Adjusted R ²	0.56
F-Statistic	58.72
p-value (F-Test)	< 0.01

Table 3 presents the multiple regression model on digital literacy, institutional support, and AI usability among social studies pre-service teachers in Oyo State. The R² value of 0.57 indicates that these predictors explain 57% of the variance in AI usability. The model is statistically significant ($F = 58.72$, $p < 0.01$), confirming their substantial influence.

Table 4: Regression Coefficients of Predictors for AI Usability

Predictor Variable	Unstandardised Coefficient (B)	Standardised Coefficient (β)	t-value	p-value	Decision
Digital Literacy	0.42	0.49	7.86	< 0.01	Significant
Institutional Support	0.38	0.44	6.92	< 0.01	Significant

Table 4 presents the regression coefficients of the predictors. Digital literacy ($\beta = 0.49$, $B = 0.42$) significantly contributes to AI usability, with a one-unit increase leading to a 0.42-unit rise ($t = 7.86$, $p < 0.01$). Institutional support ($\beta = 0.44$, $B = 0.38$) also has a significant impact, with a one-unit increase resulting in a 0.38-unit rise ($t = 6.92$, $p < 0.01$). Together, these factors explain 57% of the variance in AI usability, with digital literacy having a slightly stronger influence. The null hypothesis is rejected, confirming their significant combined effect on AI usability among social studies pre-service teachers in Oyo State.

Discussion

This study demonstrated that digital literacy and institutional support are significant determinants of AI usability among social studies pre-service teachers in Colleges of Education in Oyo State. The significant relationship between digital literacy and AI usability suggests that pre-service teachers who can access, evaluate, and apply digital tools are more likely to interact confidently and effectively with AI-powered applications. This finding aligns with the view that digital literacy forms the foundational competence needed for engaging with advanced educational technologies (Hinojo-Lucena *et al.*, 2019). It also supports the evidence that pre-service teachers with stronger digital competence show higher readiness to integrate digital resources into instructional practice (Redecker & Punie, 2017). In a similar direction, empirical studies have shown that limited digital skills often reduce teachers' willingness to engage with emerging technologies, especially where tools appear complex or unfamiliar (Crompton *et al.*, 2021). The implication is that digital literacy is not merely a general technology skill but a practical enabler that determines whether pre-service teachers can meaningfully use AI tools for learning and teaching.

Beyond the general digital competence literature, the present finding resonates with recent Nigerian-based evidence suggesting that digital-related competencies shape educational engagement and outcomes among pre-service teachers. For instance, Emmanuel and Oyewole (2025) established that media literacy a closely related competence to digital literacy significantly supports democratic sustainability outcomes among pre-service teachers. Although the outcome focus differs, their conclusion reinforces an important point that competence in digital/media environments strengthens learners' capacity to interact responsibly and effectively with modern information systems. In the context of the present study, digital literacy similarly strengthens pre-service teachers' ability to engage with AI platforms, assess outputs critically, and apply tools in pedagogically meaningful ways. Taken together, these findings suggest that digital competence and literacy (including media literacy) represent cross-cutting skills that support both academic usability and broader civic-educational outcomes in teacher education.

The significant influence of institutional support on AI usability also confirms that AI adoption is not solely dependent on individual competence; it also requires supportive conditions provided by teacher-training institutions. This

supports evidence that institutions that provide stable internet access, functional ICT infrastructure, learning platforms, and structured training opportunities tend to improve the uptake of educational technologies (Zhao et al., 2021). Similarly, studies have indicated that institutional investments in infrastructure and training significantly shape teachers' confidence and readiness to use digital tools (García-Peñalvo et al., 2021). Conversely, the present finding also reflects the reality that where institutional support is weak through limited access to devices, unstable connectivity, or absence of AI-focused policies technology adoption becomes difficult and inconsistent, as noted in related research (Ifenthaler & Schumacher, 2020). Therefore, institutional support should be interpreted as a practical "enabling environment" that can either accelerate or constrain AI usability among teacher trainees.

Importantly, the finding that digital literacy and institutional support jointly explained 57% of the variance in AI usability indicates a strong combined predictive effect. This aligns with the argument that technology adoption in education is better explained through interaction between personal capacity and contextual support than through single-factor models (Mousavizadeh et al., 2021). The results suggest that even digitally skilled pre-service teachers may underutilize AI tools if their institutions do not provide resources, training, or a supportive policy environment. Likewise, institutions may provide infrastructure, but if learners lack digital competence, AI usability remains limited. This strengthens the case for a holistic strategy, where teacher education programmes simultaneously develop learners' competencies and strengthen institutional readiness for AI integration.

The regression results further revealed that digital literacy had a slightly stronger predictive influence ($\beta = 0.49$) than institutional support ($\beta = 0.44$), implying that personal competence plays a more immediate role in determining whether pre-service teachers can actually use AI tools. This is consistent with technology use research suggesting that competence and confidence often drive engagement even when conditions are challenging (Redecker & Punie, 2017). The pattern also aligns with Nigerian evidence demonstrating that technology-related self-beliefs and competencies are powerful predictors of AI-related outcomes. For example, Oyewole and Jatau (2025) reported that technological self-efficacy and online database access significantly predict AI usability for research among social sciences lecturers in Oyo State, Nigeria (Oyewole & Jatau, 2025). Their findings reinforce the

present result by showing that competence-related variables (skills, self-efficacy, ability to access online resources) strongly determine AI usability. This suggests that for both lecturers and pre-service teachers, digital competence and technology-related confidence are central mechanisms through which AI tools become usable in academic and professional practice.

Finally, the present study's outcomes can be situated within broader empirical patterns in Nigerian teacher education that emphasize the role of digital interaction, technology proficiency, and collaboration in strengthening modern educational outcomes. Abiodun and Oyewole (2025), showed that social media usage and cultural exchange predict global economic awareness among pre-service economics teachers, indicating that digital engagement channels shape learners' awareness and educational development. Similarly, Ogundipe and Oyewole (2025) found that technological proficiency and virtual collaboration predict global adaptability among social studies pre-service teachers in Oyo State. These findings complement the present study by reinforcing that competence in digital environments and supportive engagement structures (including collaboration and institutional support) shape modern learning capacities. In sum, AI usability among pre-service teachers should be understood as part of a wider digital transformation process in teacher education, where skills (digital literacy and technology proficiency), psychological readiness (self-efficacy), and institutional systems (support structures) jointly determine successful adoption and meaningful use of emerging technologies.

Conclusion

This study highlights the crucial roles of digital literacy and institutional support in AI usability among social studies pre-service teachers in Oyo State. Strong digital skills are essential for engaging with AI tools, while institutional support—through resources, training, and policies—facilitates adoption. The combined influence of both factors underscores the need for a holistic approach, including curriculum enhancements, capacity-building, and policy reforms. Strengthening digital literacy and institutional support will improve AI integration, enhancing teacher education and equipping future educators to effectively use AI in social studies instruction.

Recommendations

Colleges of Education should integrate digital literacy training into their curricula, including specialised AI courses, to equip pre-service teachers with essential skills. Institutions must prioritise AI adoption by providing technological infrastructure, access to AI tools, and supportive policies. Regular workshops should enhance AI usability in social studies instruction, while faculty members need training to effectively guide students in AI integration. Policymakers should establish clear guidelines for AI adoption, ensuring funding and equitable access. Collaboration with EdTech companies and AI experts can provide hands-on experience, while continuous evaluation should identify challenges and improve AI usability in teacher education.

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