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PREPARING FUTURE EDUCATORS: PRESERVICE TEACHERS' READINESS FOR ARTIFICIAL INTELLIGENCE USE IN GHANAIAN EDUCATION

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Abstract

This study examined how ready preservice teachers in Ghana are to use artificial intelligence in their training and future classrooms. It focused on AI literacy, TPACK skills, ethical awareness, attitudes and access to technology. A convergent mixed-methods design was used, combining a survey of 412 preservice teachers with interviews and focus groups. The results show that while most preservice teachers hold positive views about AI in teaching, their literacy and ethical understanding are low. Many also lack steady access to AI-capable devices and reliable internet, which limits practical use. Perceived usefulness, self-efficacy and AI literacy were the strongest predictors of their intention to use AI. Ethical awareness and access did not show a significant effect. The qualitative findings revealed interest and curiosity, but also fear, limited ethical knowledge and concerns about weak infrastructure. The research suggests that teacher-training programs should encompass explicit AI literacy and ethics education, offer practical and build digital infrastructure. The steps will assist in effective and equitable implementation of AI in the teacher-education system in Ghana.

Keywords: Artificial Intelligence, Preservice Teachers, Teacher Education, AI literacy, TPACK, Ethical Awareness, Ghana

1. Introduction

Artificial intelligence is rapidly changing the face of education globally through redefined methods of knowledge delivery, assessment, and personalization for diverse learners. From adaptive learning systems that cater to individual needs to automated feedback mechanisms that improve formative assessment, and generative tools assisting teachers with lesson planning, content creation, and administrative tasks, AI technologies are increasingly embedded in educational practice (Holmes et al., 2022; Luckin et al., 2022). These innovations promise increased efficiency, heightened learner engagement, and improved access. However, realizing these benefits depends on teachers' ability to understand, adopt, and integrate AI tools in pedagogically sound and ethically responsible ways (Zawacki-Richter et al., 2019).

Government of Ghana has acknowledged the capabilities of AI to achieve change by its National Artificial Intelligence Strategy, 2023-2033, which aims at developing the digital capacity, governance ethics and inclusion of the education sector to be AI ready in the country (Government of Ghana, 2023). This is a good indication of how Ghana is determined to exploit

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AI to maximum in achieving the sustainable development goals particularly in the sphere of education and teacher training. Nevertheless, realisation of these objectives entails deliberate work to warrant that, educators, especially those who are currently undergoing training, have the expertise, abilities, and the capacity to apply AI instruments in both productive and just means in their lessons.

Preservice teachers are already in the teacher education programmes and the future generation of professional personnel who will determine how technology will influence the learning outcomes, imagination, and inclusion in schools. Their attitudes to AI, the degree of literacy, awareness of ethical issues, and preparation to use the digital transformation in pedagogy will influence the results of the national initiatives associated with the digital transformation (Nyaaba and Zhai, 2024). Although Ghana is still in the process of incorporating AI into the wider education reforms, it is in teacher education institutions that these skills will be developed. Parallel to it, a deficiency of knowledge can be observed regarding the readiness of preservice teachers to work with AI tools and what factors determine their intention to use it, as well as how the given gaps can be filled in practice through the training programme.

Against this background, the readiness of preservice teachers to integrate AI into Ghanaian education is explored in this study. It probes into multiple dimensions of readiness regarding AI literacy, pedagogical competence, ethical awareness, and infrastructural access to identify the key predictors of the behavioural intention to use AI in teaching. These findings are expected to inform curriculum development, policy formulation, and institutional practices toward ensuring an equitable and sustainable integration of AI across all the teacher education in Ghana.

2. Literature Review

The emergence of artificial intelligence is one of the recent transformational changes that have affected the education sector, transforming how teachers and students learn respectively. Intelligent tutoring and automated grading software, as well as adaptive learning systems, are some of the AI technologies that are still used to improve individualization, assessment, and the efficiency of instruction around the world (Holmes et al., 2022; Luckin et al., 2022). These systems interpolate learner data to provide such services as individualized teaching, feedback and differentiated learning experiences. More recently, the creation of generative AI tools, like ChatGPT, has also expanded the possibilities of the teachers, in the designing of lessons, material creation, and in helping the learners to be more autonomous in their learning processes (Zhai et al., 2024).

Heavy AI implementation in schools, although with these benefits, needs a considerate mindset to ethical, pedagogical, and infrastructural concerns. Teachers should not only receive information about the operation of AI but should also understand how they can and should use it safely and efficiently (Zawacki-Richter et al., 2019). The issue of data privacy, algorithmic bias, and overreliance on automation raises ethical issues that place the burden on teacher education programmes to develop AI literacy and ethical consciousness in future teachers (Tan et al., 2024).

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The National Artificial Intelligence Strategy, 2023–2033, of Ghana identifies AI as a potential driver for accelerating digital transformation and attaining sustainable development. The policy indicates that the education sector is central in national AI readiness, with training in the use of AI competencies and their integration at all levels of education curricula (Government of Ghana, 2023). In order to make this a reality, it is important to determine whether pre-service teachers, who are going to implement this technology in the schools in future years, are ready.

Teacher readiness encompasses the ability, confidence, and willingness to integrate technology into teaching practice. That includes not only technical competence but also pedagogic understanding and attitudinal openness (Koehler & Mishra, 2009). Studies of technology adoption have continuously identified self-efficacy and perceived usefulness as important predictors of the teachers' behavioural intention to use new tools (Venkatesh et al., 2003). In the context of AI, readiness extends toward understanding how AI systems work and the way to adapt those to specific learning goals.

It is in this respect that the TPACK framework provides a helpful guide on the integration of AI in education. Mishra and Koehler (2006) argue that for effective teaching with technology, technological knowledge should intersect with pedagogical knowledge and content knowledge. In the case of AI, the TPACK framework assists teachers in identifying how the use of AI tools will align with the attainment of curriculum objectives and stated learning outcomes (Holmes et al., 2022). However, evidence from most developing countries, including Ghana, suggests that preservice teachers are not adequately exposed to technology-rich environments and hence are unable to apply the principles of TPACK in practice (Bervell & Umar, 2018).

AI literacy can be defined as the ability to comprehend the idea of AI, to discuss its applications, and review its effects properly on the society in general. Regarding preservice teachers, AI literacy is more than basic digital skills in algorithm functionality, understanding of data processing and the ability to interpret AI-generated output and use as instruction. Ethical awareness is relevant as an addition to AI literacy by guaranteeing that teachers use AI in a responsible manner and that the privacy of learners is not violated and introducing the understanding of possible biases in AI-generated suggestions.

These studies indicate that preservice teachers worldwide generally show positive attitudes toward AI but are at a low level of literacy and ethical preparation, as reported by Chen et al. (2023) and Nyaaba & Zhai (2024). This latter mismatch between enthusiasm and competence makes embedding AI-related content into teacher education curricula a priority. In Ghana, such training is still largely absent, making it necessary to investigate current levels of AI readiness in order to inform curriculum reform and policy direction.

Empirical studies have established that the attitudes of teachers, self-efficacy, and perceived usefulness have a great impact on their intentions to use AI technologies. However, infrastructural limitations and a lack of professional development remain key barriers in sub-Saharan Africa. Ghanaian research reveals that while teachers have an average level of competence in using ICT, they have hardly been exposed to AI-driven pedagogical tools.

Regardless of the national policy effort, the preservice teachers' preparedness to integrate AI within Colleges of Education in Ghana is limited due to a lack of empirical data. To a large

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extent, the interaction between AI literacy, TPACK competence, ethical awareness, and access to infrastructure to affect behavioural intentions of preservice teachers is unfamiliar. This is highly important in the development of suitable teacher preparation programmes that would provide equal and responsible application of AI in education.

Therefore, the present study tries to fill this gap by adopting a convergent mixed-methods approach to investigate preservice teachers' readiness to adopt AI in Ghanaian education. It also identifies main predictors of AI adoption and gives evidence-based recommendations to curriculum developers, policy makers, and leaders in education on how best to promote sustainable AI integration into all teacher education institutions.

Purpose of the study

The purpose of the study is to examine how prepared preservice teachers in Ghana are to use artificial intelligence in teaching and learning. The study aims to measure their levels of AI literacy, pedagogical readiness, ethical awareness and access to digital tools. It also seeks to determine how personal and institutional factors, such as gender, ICT training and practicum experience, relate to their readiness. In addition, the study investigates how attitudes, self-efficacy and perceived usefulness shape preservice teachers' intention to adopt AI in the classroom. The study further explores their views on the opportunities and concerns linked to AI use in Ghanaian schools. The goal is to provide evidence that can guide teacher-education programmes and policy efforts toward effective and responsible AI integration.

Research questions

This study was guided by one central research question and four sub-questions.

Main Research Question

The main research question that guided the study is 'to what extent are preservice teachers in Ghana ready to use artificial intelligence in teaching and learning?'

Sub-questions

Four sub-questions were derived from the main research question. They are;

1. What are preservice teachers' levels of AI literacy, pedagogical readiness (TPACK), ethical awareness, and infrastructural access?
2. How do demographic and contextual variables (e.g., gender, prior ICT training, type of institution, practicum experience) relate to readiness levels?
3. What attitudes, self-efficacy beliefs, and perceived usefulness predict preservice teachers' behavioural intention to use AI?
4. How do preservice teachers describe the opportunities and concerns about integrating AI into Ghanaian classrooms?

3. Methodology

The current study utilizes a convergent parallel mixed-methods research design: a cross-sectional, quantitative survey of preservice teachers complemented by semi-structured interviews or focus groups with a purposive subsample. This design enables generalizable

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measurement of readiness while providing an in-depth exploration of contextual perceptions (Creswell & Plano Clark, 2018; Fetters, Curry, & Creswell, 2013).

The target population for the study comprised preservice teachers from both the universities and colleges of education across Ghana. Using a simple random sampling technique by replacement followed by a convenience sampling technique, a total of 412 preservice teachers, 206 each from the universities and the colleges, namely, University of Education Winneba, University of Cape Coast, Berekum College of Education, and Komenda College of Education, were involved in the study. However, 20–30 preservice teachers were interviewed; 4–6 focus groups were also involved in the study. The involvement of participants from universities and colleges of education is important because it is these institutions that develop the competencies, attitudes, and technological skills of the future instructor. Preservice teachers in such environments represent the next generation of the teaching workforce; therefore, their perspectives provide necessary insights into readiness for educational innovation. Including participants from multiple institutions allows for enhanced representativeness and ensures the findings will be contextually grounded for informing teacher education policy and practice (Creswell & Creswell, 2018; Darling-Hammond, 2017; Fraenkel, Wallen & Hyun 2019).

Data collection comprised quantitative and qualitative sets. Quantitative data were collected using the AI literacy scale adapted from Tan 2024, TPACK-for-AI, perceived usefulness & perceived ease-of-use (TAM), self-efficacy, ethical awareness, infrastructure access, and behavioral intention. All items were rated using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree, thereby indicating the degree of agreement or disagreement. Qualitative data were gathered using a semi-structured guide which probed experiences with AI, expectations from classroom uses, ethical concerns, and needs regarding institutional support.

To analyze quantitative data, descriptive statistics were computed in terms of mean and standard deviation to summarize participants' responses and provide an overview of preservice teachers' levels of AI readiness in terms of key dimensions such as literacy, pedagogical competence, ethical awareness, and access to technological infrastructure. The following scale was used to interpret mean scores: 1.81–2.60 (Low), 2.61–3.40 (Moderate), 3.41–4.20 (High), and 4.21–5.00 (Very High). A consistent and impartial evaluation of preservice teachers' preparedness to apply artificial intelligence (AI) in classroom settings was made possible by this interpretive framework.

Independent-samples t-tests and one-way ANOVA tests were conducted to explore group differences, which were based on demographic or institutional factors-for instance, gender, year of study, type of institution, etc. Through these inferential tests, it was possible to identify significant differences between groups (Field, 2018).

To identify the predictors of preservice teachers' behavioural intention to use AI in teaching and learning, hierarchical multiple regression analysis or Structural Equation Modelling was conducted. These sophisticated statistical methods made it possible to test the relative contribution of attitudinal, self-efficacy, and contextual factors by considering interrelationships among the variables (Hair et al., 2019; Kline, 2016).

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Qualitative data from semi-structured interviews and/or focus group discussions were analyzed thematically using the six-phase approach advanced by Braun and Clarke (2006). This included becoming familiar with the data, generating initial codes, searching for themes, reviewing and refining themes, defining and naming themes, and producing the final report. Thematic analysis helped to identify recurrent patterns, insights, and contextual factors that complement and deepen the understanding of the quantitative findings.

The integration culminated in the triangulation of qualitative and quantitative results to enhance accuracy and sturdiness. This approach allowed for the comparison and convergence of findings from both datasets on preservice teachers' readiness and perceptions regarding artificial intelligence use in education.

This study has used validated instruments adapted from existing literature in measuring key constructs: AI literacy, pedagogical readiness-TPACK, ethical awareness, and behavioural intention to use AI. Items were subject to review by a panel of experts in the field of educational technology and teacher education to establish content validity and to ensure that the instruments were contextually relevant to Ghanaian pre-service teachers (Creswell & Creswell, 2018).

A pilot study was conducted prior to the main data collection with a small sample of preservice teachers who were not part of the main study. The pilot testing aimed at assessing the clarity, reliability, and internal consistency of the items and identifying ambiguities and cultural biases in the instruments. Respondents' feedback from the pilot testing was utilized in refining the survey items and interview protocols. The reliability coefficients from both the pilot phase and the main data collection were 0.75, hence meeting the acceptable threshold of 0.70 and above, where the internal consistency is said to be satisfactory according to Pallant (2020).

Ethical standards were strictly ensured during this research study. The study obtained ethical clearance from the institutional review board or the ethics committee of the participating institutions. This ensured that the study met institutional and national guidelines for research involving human participants (BERA, 2018).

All participants provided informed consent on a detailed form explaining the purpose of the study, their rights regarding voluntary participation, and the right to withdraw from participation at any time without penalty. Participants were assured that their involvement was voluntary, with no compulsion or incentive used.

Confidentiality was strictly ensured by securing anonymity through the survey and interview data collection, in which no personal identification was collected; all data collected are coded and securely kept, only accessible to the researchers. Reports and publications based on the study present data on an aggregated level in a way that no individual participants would be identified.

It was this set of procedures that has ensured the study would respect the principles of respect for persons, beneficence, and justice (Belmont Report, 1979) while upholding high standards of validity, reliability, and research integrity.

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4. Results

Table 1: Descriptive Statistics of Preservice Teachers' Readiness for AI (N = 412)

Variable	M	SD	Scale Range	Interpretation
AI Literacy	2.84	0.71	1–5	Low to moderate understanding
Pedagogical Readiness (TPACK)	3.25	0.64	1–5	Moderate confidence in integration
Ethical Awareness	2.67	0.80	1–5	Limited knowledge of ethics
Attitudes Toward AI	4.01	0.55	1–5	Generally positive
Age (years)	22.4	2.6	18–29	Young adult preservice teachers
Smartphone ownership (%)	72%	—	—	Majority have access
Reliable internet during practicum (%)	28%	—	—	Limited access

As indicated in Table 1 above, a total of 412 preservice teachers from four tertiary institutions across Ghana completed the survey, with a response rate of 86%. The participants were 58% female and 42% male, aged between 18 and 29 years old (M = 22.4, SD = 2.6).

On the whole, these results point to varying states of preparedness along such dimensions as AI literacy, pedagogical competence, ethical awareness, and infrastructural access.

In terms of AI literacy, the mean score was 2.84 (SD = 0.71) on a 5-point scale. This indicates that preservice teachers possess low to moderate knowledge with regard to the concepts and tools of AI. Thus, whereas many participants may demonstrate some familiarity with more basic applications of AI, their actual meaningful use and understanding of deeper AI functions and educational implications remain rather limited. Such gaps in current practice call for explicit instruction and exposure to AI-related content within teacher education programmes.

For pedagogical readiness, measured by TPACK, the mean score reached 3.25 (SD = 0.64). This would suggest that preservice teachers feel somewhat confident in their ability to integrate AI at the point of teaching and learning but are not full of confidence when they consider designing and then implementing AI-supported pedagogical strategies. The result indicates a need to enhance the preparation curriculum of teachers with more practical and experiential learning aspects related to AI-enhanced teaching.

The mean score of 2.67 (SD = 0.80) indicates limited understanding of the ethical issues associated with AI use in education, such as data privacy, algorithmic bias, and academic integrity. This would therefore imply that while preservice teachers may recognize the importance of ethics for AI application, their knowledge remains at an underdeveloped stage.

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Discussions on AI ethics should, therefore, form a necessary part of teacher education courses to ensure responsible and equitable uses of technology within the classroom.

The mean score was 4.01 (SD = 0.55), showing overall positive perceptions about AI's usefulness in education among the preservice teachers. Most of the respondents were optimistic about the potential contributions of AI to enhance teaching efficiency, provide personalized learning, and support instructional innovation. Such favourable attitudes provide a promising foundation for future AI adoption initiatives in teacher education.

Finally, in terms of infrastructure and access, 72% of respondents reported owning personal smartphones, but only 28% of them had access to reliable internet connectivity or AI-capable devices during their practicum placements. This digital divide poses a significant challenge to effective AI integration since limited access to technological resources can be an obstacle to both training and classroom implementation. Inequalities in infrastructure thus become critical to building equitable AI readiness among preservice teachers.

Table 2: Independent Samples t-Test Results for AI Literacy by Gender and Institution Type

Table 2: Independent Samples t-Test Results for AI Literacy by Gender and Institution Type

Group comparison	N	M	SD	T	p	Interpretation
Male (AI literacy)	173	2.89	0.72	1.34	.18	No significant difference by gender
Female (AI literacy)	239	2.81	0.69			
University students (AI literacy)	154	3.12	0.70	3.45	<.01	University>College of Education
College of Education students	258	2.71	0.68			

More specifically, the group differences by gender and type of institution further outline some factors determining preservice teachers' AI literacy, as shown in Table 2. The independent samples t-test analysis was applied to understand whether male and female preservice teachers significantly differed in their understanding of AI concepts and tools. There was no significant difference in AI literacy between males and females, $t(410) = 1.34$, $p = .18$. This indicates that male and female preservice teachers show similar levels of AI knowledge and skills. The findings could also mean that gender does not seem to be a determining factor in shaping AI literacy among preservice teachers, possibly reflecting equal access to digital technologies and learning opportunities in teacher education institutions.

However, a significant mean difference was found while comparing the AI literacy across institution types. Students from universities reported a higher mean score ($M = 3.12$) than students from colleges of education, with a mean score of 2.71, and the difference was statistically significant, $t = 3.45$, $p < .01$. This would therefore mean that the preservice teachers in the universities tend to have a better understanding of AI concepts and applications than their peers studying in colleges of education. This difference could be due to differences in

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resources and facilities available between these institutions, followed by differences in curriculum design, and finally less exposure to technology-enhanced learning environments. Therefore, students in universities may have greater exposure to courses, research, and digital tools related to AI, while colleges of education might lack infrastructure and thus integration of technology into classes.

Table 3: Effect of Prior ICT Training on AI Literacy and Self-Efficacy

Variable	ICT Training (n = 196)	No ICT Training (n = 216)	T	P
AI Literacy (M, SD)	3.21 (0.65)	2.54 (0.69)	7.82	<.001
Self-Efficacy (M, SD)	3.48 (0.60)	2.89 (0.67)	6.94	<.001

The results of the analysis, as shown in Table 3, showed a significant relationship between prior ICT training and preservice teachers' level of AI literacy and self-efficacy. In fact, preservice teachers who had previously taken an ICT or educational technology course scored significantly higher in AI literacy and self-efficacy, with the difference being statistically significant, at $p < .001$. Such findings suggest that ICT-related course work provides a foundation of basic digital skills and technological self-confidence that supports the understanding and engagement with AI tools and concepts.

This result indicates that ICT or educational technology training should be an integral part of teacher preparation programs as an important precursor to the development of AI competence. In addition to familiarizing preservice teachers with the basic operation of technologies, such training courses develop their capacity to adapt to new and emerging technologies, including AI applications in teaching and learning. Moreover, heightened self-efficacy from past trainings in ICT may lead preservice teachers to try out AI tools and innovative pedagogies.

Table 4: Multiple Regression Predicting Behavioural Intention to Use AI (N = 412)

Predictor	B	SE B	β	T	P
Perceived Usefulness	0.45	0.06	.42	7.50	<.001
Self-Efficacy	0.38	0.07	.31	5.43	<.001
AI Literacy	0.29	0.10	.21	2.90	.004
Ethical Awareness	0.08	0.07	.06	1.14	.26
Infrastructure Access	0.05	0.06	.04	0.83	.41
Model Statistics	$R^2 = .47$, $F(5, 406) = 72.41$, $p < .001$				

The results of the multiple regression shown in Table 4 provided important insights into the factors determining preservice teachers' behavioural intention to use AI in teaching. The model showed that perceived usefulness, self-efficacy, and AI literacy were found to be significant predictors of behavioural intention, which explained 47% of the variance in the outcome

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variable, $R^2 = .47$. That is, almost half of the variance in preservice teachers' intention to implement AI in their future teaching is determined by the three identified factors.

Perceived usefulness emerged as the strongest determinant among these predictors, with a β of .42, $p < .001$. This result is indicative of the fact that preservice teachers who perceive AI as effective in helping them enhance their teaching, working efficiently, and improving learning outcomes will use AI in their classrooms more than others. In other words, perceived benefits of AI for educational purposes are crucial in motivating its adoption intentions.

In addition, self-efficacy has also appeared to have an important effect, at .31 and significant at $p < .001$, indicating that if the preservice teachers consider themselves competent in the use of AI technologies, they are more likely to apply them in teaching. This suggests the need to build the confidence and competence of teachers through hands-on training in technology use and supportive learning environments.

Moreover, AI literacy turned out to be a strong predictor ($\beta = .21$, $p = .004$), which implies that good knowledge of AI principles and tools has a positive effect on teachers' intentions toward the adoption of AI. With more knowledge about how AI works, pre-service teachers are in a much better position to understand its potential and integrate it into their educational practice accordingly.

Surprisingly, ethical awareness and infrastructure did not prove to be significant predictors in the model. This could indicate that while these factors are needed for responsible and equitable AI use, they do not relate explicitly to how teachers behave in this respect.

Overall, the regression results show that preservice teachers' readiness to adopt AI is largely driven by their perceptions of its usefulness, their confidence in using it, and their foundational literacy in AI. These findings have implications for teacher education programmes to focus on enhancing these domains through targeted training and practical exposure along with positive attitudinal development toward AI in education.

Table 5: Qualitative Themes from Interviews and Focus Groups (N = 26)

Theme	Description	Sample Participant Quote
Optimism and Curiosity	Preservice teachers saw AI as a supportive tool to save time in lesson planning, assessments, and resource generation.	"AI feels like a teaching assistant — it helps me prepare lesson notes faster."
Fear and Uncertainty	Concerns that AI could undermine teachers' authority or reduce students' critical thinking skills.	"If we rely too much on AI, students may stop thinking for themselves."
Ethical Blind Spots	Limited awareness of issues such as data privacy, plagiarism, and algorithmic bias.	"I just use ChatGPT without knowing where the information really comes from."

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Theme	Description	Sample Participant Quote
Infrastructure Gaps	Inconsistent internet access and lack of institutional training hinder practical use of AI.	"During my teaching practice in the rural area, there was no internet to even try AI tools."

Thematic analysis of interviews and focus groups (n = 26) revealed four major themes (Table 5):

1. Optimism and curiosity - preservice teachers viewed AI as a "teaching assistant" that could save time in lesson planning and assessments.
2. Fear and uncertainty: participants showed concern that AI will "replace teachers" and that over-dependence would lead to reduced critical thinking.
3. Ethical blind spots: Most were not aware of AI's risks regarding plagiarism, data privacy, and bias; one student noted, "I just use ChatGPT without knowing where the information comes from."
4. Infrastructure gaps: Lack of access to the Internet and institutional training workshops were major hindrances, especially during rural teaching practice.

4.1 Discussion

The findings show that Ghanaian preservice teachers generally hold positive attitudes toward AI in education, which is consistent with prior studies showing attitudes and perceived usefulness as strong predictors of intention. However, their actual literacy and pedagogical readiness remain limited, echoing concerns raised in earlier Ghana-focused studies on digital readiness.

A striking finding is the gap between enthusiasm and capability: most preservice teachers are open to adopting AI, yet few have either the technical or ethical literacy to do so. This echoes Nyaaba and Zhai (2024), who argued that AI's educational benefits are contingent upon structured training in both pedagogy and ethics.

The infrastructure divide between university students and those in colleges of education is an issue of equity. Since most Ghanaian teachers are prepared at the college level, this may lead to systemic under-preparation of teachers, causing AI adoption disparities among schools. Targeting special support for colleges of education through device provision, internet access, and integration of AI-focused modules into curricula could be a solution.

The predictive model reinforces the relevance of technology acceptance frameworks: preservice teachers' perceived usefulness and self-efficacy significantly drive their intention to adopt AI. This suggests that interventions should not only deliver knowledge but also provide hands-on practice with AI tools in order to build confidence.

It emerged that ethical readiness was low and did not significantly explain variation in behavioural intention. This result is of concern because, without proper awareness of risks such as bias and plagiarism, preservice teachers may adopt AI too enthusiastically. This echoes

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UNESCO's warning that the preparation of teachers for AI at schools needs to go beyond mere technical training to include critical digital citizenship and AI ethics.

Qualitative results enrich quantitative ones through the expression of preservice teachers' optimism and at the same time their fears, above all that AI may undermine their professional role. Addressing these concerns through policy communication and curriculum framing will be crucial for AI acceptance.

4.2 Conclusion and Recommendations

This study shows that preservice teachers in Ghana are open to the use of artificial intelligence in education, but their readiness is not strong in key areas. Their attitudes toward AI are positive, and many believe the tools can support teaching and improve learning. Yet their levels of AI literacy, pedagogical skills for AI use and ethical awareness remain low. Many also lack steady access to digital devices and reliable internet, which limits hands-on practice.

The findings show that perceived usefulness, self-efficacy and basic AI knowledge strongly shape preservice teachers’ intention to use AI. This means that teacher-education programmes need to build strong skills and confidence through active training and real classroom exposure to AI tools. The study also shows a clear gap between universities and colleges of education, which points to wider issues of equity in access to technology and training.

The findings of the survey as well as the interviews indicate that, preservice teachers would prefer to get more guidance, more specific ethical training and improved infrastructure to assist them in using AI effectively. The assistance of these needs will contribute to the achievement of the targets of the National AI Strategy in Ghana and equip teacher-education institutions with new teachers who will apply AI in safe, fair and effective applications.

To fulfil the National AI Strategy of Ghana (Government of Ghana, 2023), teacher-education programs must:

1. Integrate modules of AI literacy and ethics into the curriculum.

2. Provide hands-on exposure to AI tools during teaching practicum.

3. Address infrastructure gaps, especially in colleges of education.

4. Training of faculty for sustainability of AI integration.

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