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# Preparedness of Teachers for AI-Mediated Classrooms: Gaps in Skills Confidence and Ethical Issues in Teaching with AI

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**Abstract:** Artificial intelligence (AI) is reshaping teaching, assessment, and professional practice, but effective classroom integration depends on teachers' preparedness. This study examined the self-reported preparedness of secondary school teachers for AI-mediated classrooms and tested the predictive associations of AI-related skills gaps, professional confidence, and ethical concerns with preparedness. A quantitative cross-sectional survey was conducted with 296 public secondary school teachers in Gusau metropolis, Zamfara State, Nigeria, selected from a population of 1,800 through multistage sampling. Data were analysed using descriptive statistics and regression. Teachers reported high overall preparedness ($M = 2.69$, $SD = 0.56$) and professional confidence ($M = 2.76$, $SD = 0.54$), alongside moderate AI-related skills gaps ($M = 2.41$, $SD = 0.58$) and ethical concerns ($M = 2.63$, $SD = 0.61$). In the combined model, professional confidence was the strongest positive predictor of preparedness ($\beta = 0.41$, $p < .001$), whereas skills gaps ($\beta = -0.29$, $p < .001$) and ethical concerns ($\beta = -0.18$, $p < .001$) were negative predictors. The model explained 46% of the variance in preparedness. The findings support professional development that integrates AI pedagogy, confidence-building, and ethical literacy for secondary teachers.

**Keywords:** AI in education, teacher preparedness, secondary education, professional confidence, AI ethics.

## Introduction

Artificial intelligence is becoming part of educational practice through generative AI, automated assessment, learning analytics, intelligent tutoring, and other data-driven tools. These developments can support differentiated instruction, feedback, lesson preparation, and administrative work, but they also alter teachers' professional responsibilities and require new forms of judgment about accuracy, pedagogy, privacy, bias, and learner protection (Holmes et al., 2019; UNESCO, 2023; U.S. Department of Education, 2023). UNESCO's AI competency framework for teachers further emphasizes that meaningful use of AI requires a human-centred mindset, ethical competence, AI foundations and applications, AI pedagogy, and professional learning rather than basic digital literacy alone (UNESCO, 2024).

Recent evidence places teacher preparedness at the centre of responsible AI adoption. Granström and Oppi (2025), in a large survey of Estonian teachers, found that readiness and perceived usefulness were closely associated with teachers' reported use of AI, while limited training opportunities and AI-related anxiety remained barriers. A systematic review by Tan et al. (2025) similarly shows that teachers' professional development needs extend beyond tool use to pedagogical integration and continuing professional learning. Research on K-12 teachers further shows that TPACK readiness and attitudes are important when planning AI-related teacher development (Yue et al., 2024), while broader reviews of teachers' engagement with AI identify both pedagogical opportunities and implementation challenges (Celik et al., 2022). These findings make it important to distinguish what teachers can do with AI from how confident they feel about doing it and what ethical reservations shape their willingness to use it. Research on educational technology also shows that teacher technology acceptance and self-efficacy remain important conditions for classroom integration (Scherer et al., 2021; Tondeur et al., 2018).

Secondary school teachers warrant particular attention. They teach subject-specialist curricula, make frequent assessment decisions, and work with school-age learners whose data protection, academic integrity, and developmental needs heighten the consequences of inappropriate AI use. Ethical questions are especially salient in K-12 contexts, where concerns include privacy, bias, transparency, surveillance, accountability, and the protection of children's interests (Akgun & Greenhow, 2022; Gouseti et al., 2025; Wieczorek et al., 2025). At the same time, school systems in resource-constrained contexts may have uneven access to infrastructure, professional development, and institutional guidance, creating a setting in which psychological readiness can coexist with technical or ethical uncertainty. This concern is consistent with wider scholarship on AI and education, which emphasizes that AI adoption brings pedagogical opportunities alongside governance, privacy, accountability, and professional-role questions (Ouyang & Jiao, 2021; Selwyn, 2019; Williamson & Eynon, 2020).

The empirical gap is therefore not simply whether teachers are favourable toward AI. Existing literature has often considered technology acceptance, general digital competence, or broad AI opportunities, while fewer studies have examined secondary teachers' preparedness as an outcome that is simultaneously related to perceived AI-related skills gaps, AI-specific professional confidence, and ethical concerns, particularly in a Nigerian public-school context. The present study addresses that gap using data from secondary school teachers in Gusau metropolis, Zamfara State. It treats preparedness as a distinct outcome and examines the extent to which the three predictor domains are associated with it, without making causal claims from cross-sectional data. Studies of AI applications and digital transformation have documented rapid expansion of AI-related educational practices, but much of the literature has focused on applications, higher education, or general technology adoption rather than the combined preparedness of secondary teachers (Boateng et al., 2023; Chen et al., 2020; Zawacki-Richter et al., 2019).

## THEORETICAL AND CONCEPTUAL FRAMEWORK

The study is guided primarily by the Technological Pedagogical Content Knowledge (TPACK) framework, which holds that effective technology integration depends on the interaction of technological, pedagogical, and content knowledge (Mishra & Koehler, 2006). In an AI-mediated classroom, this integration includes selecting appropriate AI tools, interpreting AI-generated outputs, incorporating AI into lesson planning, and evaluating whether AI use supports subject-specific learning goals. AI-related skills gaps are therefore conceptualized as perceived deficits in the technological-pedagogical competencies needed to integrate AI into instruction. The broader TPACK literature emphasizes the integration of technological, pedagogical, and content knowledge rather than isolated technical proficiency (Koehler et al., 2014).

Professional confidence is treated as an AI-specific self-efficacy construct rather than as a synonym for competence or preparedness. Bandura's (1997) self-efficacy theory provides the general theoretical basis for understanding beliefs about one's capability to perform a task; it is not used here as direct evidence about AI. Recent AI-specific empirical evidence indicates that teachers who report greater readiness and confidence are more likely to use AI tools and perceive them as useful (Granström & Oppi, 2025). In this study, professional confidence refers to teachers' belief that they can use, experiment with, and manage AI-supported instruction. Preparedness, by contrast, is the broader outcome: teachers' perceived capacity to plan, conduct, and evaluate teaching in an AI-mediated environment.

Ethical concerns constitute a third, AI-specific predictor domain. AI introduces risks that are not reducible to technical skill, including data privacy, algorithmic bias, opacity, accountability, and possible erosion of professional autonomy. The UNESCO (2024)

framework positions ethics and human agency as core teacher competencies, while evidence from K-12 literature shows that ethical concerns are integral to decisions about whether and how AI should be used with school-age learners (Gouseti et al., 2025). Ethical concerns are therefore conceptualized as perceived risks and unresolved uncertainties that may constrain teachers' sense of preparedness even when confidence is relatively high.

The conceptual model consequently distinguishes four constructs. AI-related skills gaps represent perceived deficits in AI-related pedagogical competence; professional confidence represents AI-specific self-efficacy; ethical concerns represent perceived risks surrounding responsible use; and preparedness is the perceived capacity to plan, implement, and evaluate instruction in AI-mediated classrooms. The model proposes that the three predictor domains are associated with preparedness, with the direction and strength of those associations determined empirically.

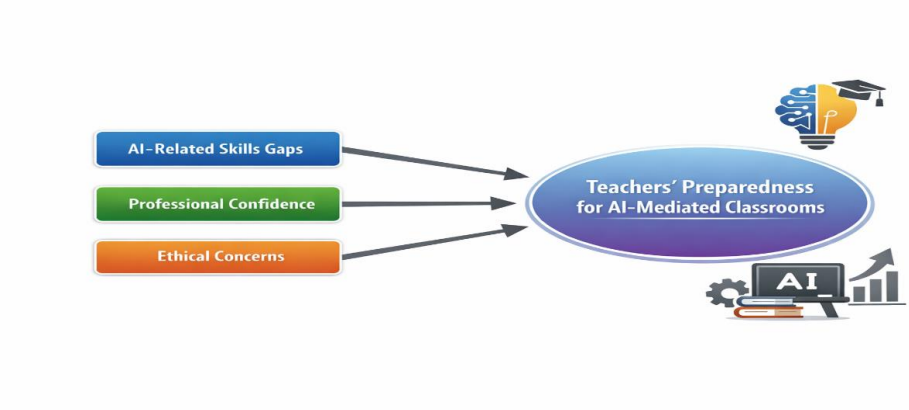


**Figure 1. Conceptual framework for teachers' preparedness for AI-mediated classrooms.**

In Figure 1, AI-related skills gaps, professional confidence, and ethical concerns are modelled as conceptually distinct predictors of teachers' preparedness. The framework does not assume that all predictors operate in the same direction; regression analysis is used to estimate their individual and joint predictive associations.

## Research Objectives

The main purpose of the study was to examine secondary school teachers' preparedness for AI-mediated classrooms and the predictive associations of AI-related skills gaps, professional confidence, and ethical concerns with preparedness. Specifically, the study sought to:

**1.** determine the level of teachers' preparedness for AI-mediated classrooms;
**2.** determine the level of teachers' AI-related skills gaps;
**3.** determine the level of teachers' professional confidence in using AI for teaching;
**4.** determine the level of teachers' ethical concerns regarding AI-mediated teaching; and
**5.** examine the individual and joint predictive associations of AI-related skills gaps, professional confidence, and ethical concerns with teachers' preparedness for AI-mediated classrooms.

## Research Questions

**1.** What is the level of teachers' preparedness for AI-mediated classrooms?
**2.** What is the level of teachers' AI-related skills gaps?
**3.** What is the level of teachers' professional confidence in using AI for teaching?
**4.** What is the level of teachers' ethical concerns regarding AI-mediated teaching?
**5.** To what extent do AI-related skills gaps, professional confidence, and ethical concerns individually and jointly predict teachers' preparedness for AI-mediated classrooms?

**Research Hypotheses**

**H01:** AI-related skills gaps do not significantly predict teachers' preparedness for AI-mediated classrooms.

**H02:** Professional confidence does not significantly predict teachers' preparedness for AI-mediated classrooms.

**H03:** Ethical concerns do not significantly predict teachers' preparedness for AI-mediated classrooms.

**H04:** AI-related skills gaps, professional confidence, and ethical concerns do not jointly predict teachers' preparedness for AI-mediated classrooms.

## METHODS

### Research Design

The study employed a quantitative cross-sectional survey design. This design was appropriate for describing teachers' self-reported preparedness, AI-related skills gaps, professional confidence, and ethical concerns at one point in time and for estimating statistical associations among those variables. Because the data were cross-sectional and non-experimental, regression coefficients are interpreted as predictive associations rather than causal effects.

### Population and Sampling

The study population comprised 1,800 teachers in public secondary schools in Gusau metropolis, Zamfara State, Nigeria, and the final analytic sample comprised 296 teachers. Secondary school teachers were selected because they are directly responsible for subject-specific instruction and assessment while working with school-age learners for whom responsible data use, academic integrity, and pedagogical oversight are particularly important when AI tools are introduced. A multistage sampling procedure was used. Public secondary schools in the metropolis were first listed, the achieved sample was distributed across schools in relation to teacher population, and individual teachers were selected through simple random sampling. This procedure was intended to distribute participation across schools while reducing selection bias at the individual-teacher level. Because the available study documentation does not establish a separate a priori sample-size calculation, no unsupported claim about the derivation of the sample size is made.

### Research Instrument

Data were collected with a structured questionnaire titled Teachers' Preparedness for AI-Mediated Classrooms Questionnaire (TPAIMCQ). The questionnaire operationalized four constructs that corresponded to the conceptual framework: AI-related skills gaps, professional confidence, ethical concerns, and preparedness. The skills-gap section covered areas such as selecting AI tools, integrating AI into lesson planning, interpreting AI-generated outputs, and data literacy. The professional-confidence section assessed teachers' perceived capability and comfort in using and managing AI-supported lessons. The ethical-concerns section addressed privacy, bias, transparency, and teacher autonomy. The preparedness section assessed perceived readiness to plan, integrate, and ethically manage AI-supported instruction. Items were rated on a four-point Likert scale from 1 (Strongly Disagree) to 4 (Strongly Agree), with no neutral midpoint.

The TPAIMCQ was author-developed for this study rather than adopted as a single pre-existing scale. The initial item pool was generated from the study's conceptual definitions and the literature underpinning the four domains. Items on AI-related pedagogical skills were informed by the TPACK framework (Mishra & Koehler, 2006; Koehler et al., 2014) and AI-literacy literature (Ng et al., 2021); professional-confidence items were framed as AI-specific

self-efficacy with Bandura (1997) providing the general self-efficacy foundation; ethical-concern items were informed by AI-in-education guidance and K-12 ethics literature (Akgun & Greenhow, 2022; Gouseti et al., 2025; UNESCO, 2024; Wieczorek et al., 2025); and preparedness items were generated to reflect the capacity to plan, implement, and evaluate AI-mediated instruction. The draft item pool was then subjected to expert review and pilot testing as described below.

Face and content validity were reviewed by experts in Educational Technology, Teacher Education, and Measurement and Evaluation. The review focused on clarity, relevance, alignment of items with the intended construct domains, and appropriateness for secondary school teachers; feedback was used to refine the final instrument. A pilot study involving 30 secondary school teachers was conducted to assess internal consistency. Cronbach's alpha coefficients were 0.82 for AI-related skills gaps, 0.85 for professional confidence, 0.79 for ethical concerns, and 0.83 for preparedness; the overall coefficient was 0.84. These values exceeded the commonly used 0.70 criterion for acceptable internal consistency. Because no factor-analytic validation was conducted, the present evidence supports content alignment and internal consistency rather than a definitive claim of factorial construct validity; this is acknowledged as a measurement limitation.

### Data Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS). Means and standard deviations were used to answer Research Questions 1–4. Simple regression analyses were used to test H01-H03, and multiple regression was used to test H04 and answer Research Question 5. Statistical significance was evaluated at alpha = .05. Regression results are interpreted as predictive associations, consistent with the cross-sectional design.

### Ethical Procedures

Ethical approval for the study was obtained from the Federal College of Education (Technical), Gusau Research and Publication Ethics Committee (Approval No. FCETG/RPEC/26/013). Permission to conduct the study was also obtained from the relevant school authorities. Participation was voluntary, informed consent was obtained from all participants, and respondents were informed that they could withdraw without penalty. Anonymity and confidentiality were maintained throughout the study, and findings were reported in aggregate form so that individual participants could not be identified.

## RESULTS

### Research Question 1: What is the level of teachers' preparedness for AI-mediated classrooms?

**Table 1. Descriptive statistics for teachers' preparedness for AI-mediated classrooms (n = 296)**

| Dimension of preparedness | Mean (M) | SD | Interpretation |
|---|---|---|---|
| Instructional readiness for AI use | 2.72 | 0.55 | High |
| Ability to integrate AI into teaching | 2.68 | 0.57 | High |
| Ethical readiness for AI use | 2.66 | 0.58 | High |
| Overall preparedness | 2.69 | 0.56 | High |

Table 1 shows a high overall level of self-reported preparedness (M = 2.69, SD = 0.56). The three dimensions were similar in magnitude, with instructional readiness recording the highest mean and ethical readiness the lowest.

## Research Question 2: What is the level of teachers' AI-related skills gaps?

**Table 2. Descriptive statistics for AI-related skills gaps**

| Skill area | Mean (M) | SD | Interpretation |
|---|---|---|---|
| Ability to select AI tools | 2.38 | 0.61 | Moderate |
| AI integration in lesson planning | 2.42 | 0.59 | Moderate |
| Interpreting AI-generated outputs | 2.36 | 0.62 | Moderate |
| Data literacy for AI use | 2.47 | 0.56 | Moderate |
| Overall skills gap | 2.41 | 0.58 | Moderate |

Teachers reported a moderate overall AI-related skills gap (M = 2.41, SD = 0.58). The highest mean gap was in data literacy, while the lowest was in interpreting AI-generated outputs; all four skill areas remained within the moderate category.

## Research Question 3: What is the level of teachers' professional confidence in using AI for teaching?

**Table 3. Descriptive statistics for teachers' professional confidence in AI use**

| Confidence indicator | Mean (M) | SD | Interpretation |
|---|---|---|---|
| Confidence in using AI tools | 2.78 | 0.54 | High |
| Comfort experimenting with AI | 2.74 | 0.56 | High |
| Managing AI-supported lessons | 2.79 | 0.52 | High |
| Willingness to continue AI use | 2.73 | 0.55 | High |
| Overall confidence | 2.76 | 0.54 | High |

Overall professional confidence was high (M = 2.76, SD = 0.54). Confidence in managing AI-supported lessons had the highest mean, while willingness to continue AI use had the lowest, although all indicators were classified as high.

## Research Question 4: What is the level of teachers' ethical concerns regarding AI-mediated teaching?

**Table 4. Descriptive statistics for ethical concerns related to AI use**

| Ethical concern | Mean (M) | SD | Interpretation |
|---|---|---|---|
| Data privacy and security | 2.71 | 0.60 | High |
| Algorithmic bias | 2.64 | 0.63 | Moderate |
| Transparency of AI decisions | 2.59 | 0.61 | Moderate |
| Loss of teacher autonomy | 2.57 | 0.62 | Moderate |
| Overall ethical concerns | 2.63 | 0.61 | Moderate |

Teachers reported a moderate overall level of ethical concern (M = 2.63, SD = 0.61). Data privacy and security was the only individual indicator classified as high, suggesting that protection of learner information was the most salient ethical issue measured.

## Hypothesis 1: AI-related skills gaps do not significantly predict teachers' preparedness for AI-mediated classrooms.

**Table 5. Simple regression of AI-related skills gaps on preparedness**

| Predictor | B | SE | beta | t | p | $R^2$ |
|---|---|---|---|---|---|---|
| Constant | 1.12 | 0.14 | — | 8.00 | < .001 | |
| AI-related skills gaps | -0.46 | 0.05 | -0.46 | -9.20 | < .001 | 0.21 |

AI-related skills gaps were significantly and negatively associated with preparedness (beta = -0.46, $p < .001$). Skills gaps explained 21% of the variance in preparedness ($R^2 = 0.21$). H01 was therefore rejected.

**Hypothesis 2: Professional confidence does not significantly predict teachers' preparedness for AI-mediated classrooms.**

**Table 6. Simple regression of professional confidence on preparedness**

| Predictor | B | SE | beta | t | p | $R^2$ |
|---|---|---|---|---|---|---|
| Constant | 0.98 | 0.13 | — | 7.54 | < .001 | |
| Professional confidence | 0.52 | 0.05 | 0.52 | 10.40 | < .001 | 0.27 |

Professional confidence was significantly and positively associated with preparedness (beta = 0.52, $p < .001$). Confidence explained 27% of the variance in preparedness ($R^2 = 0.27$). H02 was therefore rejected.

**Hypothesis 3: Ethical concerns do not significantly predict teachers' preparedness for AI-mediated classrooms.**

**Table 7. Simple regression of ethical concerns on preparedness**

| Predictor | B | SE | beta | t | p | $R^2$ |
|---|---|---|---|---|---|---|
| Constant | 1.35 | 0.16 | — | 8.44 | < .001 | |
| Ethical concerns | -0.31 | 0.06 | -0.31 | -5.17 | < .001 | 0.10 |

Ethical concerns were significantly and negatively associated with preparedness (beta = -0.31, $p < .001$), explaining 10% of the variance ($R^2 = 0.10$). H03 was therefore rejected.

**Research Question 5 and Hypothesis 4: To what extent do the three predictors individually and jointly predict preparedness?**

**Table 8. Multiple regression model predicting teachers' preparedness**

| Predictor | B | SE | beta | t | p |
|---|---|---|---|---|---|
| Constant | 0.84 | 0.12 | — | 7.00 | < .001 |
| AI-related skills gaps | -0.29 | 0.04 | -0.29 | -7.25 | < .001 |
| Professional confidence | 0.41 | 0.05 | 0.41 | 8.20 | < .001 |
| Ethical concerns | -0.18 | 0.05 | -0.18 | -3.60 | < .001 |

The combined model was statistically significant, $R^2 = 0.46$, $F(3, 292) = 82.90$, $p < .001$, and explained 46% of the variance in preparedness. Professional confidence was the strongest predictor (beta = 0.41), followed by AI-related skills gaps in absolute magnitude (beta = -0.29) and ethical concerns (beta = -0.18). Thus, greater confidence was associated with higher preparedness, whereas larger skills gaps and greater ethical concerns were associated with lower preparedness. H04 was rejected.

## DISCUSSION

The purpose of this study was to examine secondary school teachers' preparedness for AI-mediated classrooms and to determine how AI-related skills gaps, professional confidence, and ethical concerns were associated with preparedness. The results show a differentiated pattern: teachers reported high preparedness and high professional confidence, but also moderate skills gaps and moderate ethical concerns. In the combined model, confidence was the strongest positive predictor, while skills gaps and ethical concerns were negative predictors. These findings support a multidimensional interpretation of preparedness rather than a single measure of general technological optimism.

For Research Question 1, the high mean level of preparedness suggests that respondents generally perceived themselves as ready to work in AI-mediated classrooms. This should not be interpreted as evidence of demonstrated competence because preparedness was self-reported. The pattern is broadly consistent with recent teacher-focused evidence showing that

many educators express openness to AI and perceive themselves as increasingly ready to use it, especially when they have prior exposure and see practical value in the tools (Granström & Oppi, 2025). In secondary education, such perceived readiness is important because teachers must integrate AI without weakening curricular goals, assessment integrity, or teacher oversight.

Research Question 2 showed moderate AI-related skills gaps, and the regression analysis indicated that larger gaps were associated with lower preparedness. This finding aligns with the TPACK perspective: teachers may be comfortable with technology while still lacking the integrated technological-pedagogical knowledge needed to select, interpret, and use AI effectively within subject teaching (Mishra & Koehler, 2006). It also accords with AI-literacy scholarship that treats effective AI engagement as involving understanding, use, critical evaluation, and ethical awareness rather than tool operation alone (Ng et al., 2021). Recent reviews likewise emphasize that teacher professional development for AI must address pedagogical integration, not simply familiarity with digital tools (Dogan, 2025; Tan et al., 2025). For secondary teachers, targeted support in evaluating AI outputs, lesson design, data literacy, and subject-specific use is therefore more relevant than generic digital-skills training alone. This interpretation is also consistent with literature showing that effective technology integration depends on more than access or basic operational competence (Hinojo-Lucena et al., 2022; Kimmons et al., 2021).

Research Question 3 found high professional confidence, and confidence was the strongest positive predictor in the multiple regression model. Bandura's (1997) theory is relevant here only as a general explanation of self-efficacy: beliefs about capability can shape persistence and willingness to engage with demanding tasks. The AI-specific empirical comparison comes from more recent studies. Granström and Oppi (2025), for example, reported that teachers who had used AI tools rated their readiness and perceived usefulness more highly than non-users. The present findings similarly suggest that confidence may be an important psychological resource for engaging with AI-mediated teaching, although the cross-sectional design cannot establish whether confidence precedes preparedness or develops alongside it. Evidence from technology-acceptance research similarly links teachers' beliefs, self-efficacy, and perceived usability with stronger intentions to integrate technology into practice (Scherer et al., 2021; Tondeur et al., 2018).

Research Question 4 identified moderate ethical concerns, with privacy and security rated most highly. Ethical concerns also had a significant negative predictive association with preparedness. This pattern is especially important in secondary schools because AI use can involve children's data, opaque automated outputs, and decisions that require continued human accountability. Gouseti et al. (2025) identify privacy, bias, transparency, surveillance, and child-centred governance as recurring ethical issues in K-12 AI literature, and Wieczorek et al. (2025) similarly document ethical concerns specifically across primary and secondary education. UNESCO (2024) places ethical judgment and human agency at the core of teacher AI competence. Ethical concern should therefore not be viewed simply as resistance to innovation; it may also reflect appropriate professional caution when clear institutional safeguards are absent. These concerns echo long-standing critiques of datafication and AI in education, particularly around opacity, privacy, accountability, and the redistribution of professional judgment (Selwyn, 2019; Williamson & Eynon, 2020).

Research Question 5 showed that the three predictors jointly explained 46% of the variance in preparedness. The order of predictive strength was professional confidence, AI-related skills gaps, and ethical concerns. This corrected interpretation is important because the negative coefficient for skills gaps was larger in absolute magnitude than the coefficient for ethical concerns. Taken together, the findings suggest that preparedness reflects both enabling and constraining conditions: confidence is positively associated with readiness, while unresolved

capability gaps and ethical concerns are negatively associated with it.

Alternative interpretations should also be considered. All four constructs were measured by self-report in the same questionnaire at the same point in time. Professional confidence and perceived preparedness are conceptually related, so part of their strong association may reflect shared method variance or overlap in respondents' self-perceptions. Similarly, teachers who are generally optimistic about technology may rate both confidence and preparedness more highly. The regression model therefore identifies statistical prediction within this dataset, not causal pathways. Future studies should combine self-report with performance-based measures of AI competence, classroom observation, longitudinal designs, and stronger psychometric validation to separate these constructs more clearly.

## Implications for Secondary Education

### Practical Implications

Professional development for secondary teachers should combine three elements: practical AI pedagogy, structured opportunities to build confidence through guided use, and ethical decision-making. Training should be subject-sensitive and classroom-based, allowing teachers to practise evaluating AI outputs, designing AI-supported activities, protecting learner data, and preserving teacher judgment. Peer mentoring and professional learning communities may help translate general confidence into more reliable classroom competence.

### Policy Implications

School leaders and education authorities should provide clear rules for acceptable AI use, data privacy, transparency, assessment integrity, and human oversight. UNESCO's AI competency framework for teachers provides a useful reference because it integrates human-centred values, ethics, AI foundations, pedagogy, and professional learning (UNESCO, 2024). In resource-constrained school systems, policy implementation should also address access to infrastructure and equitable training so that AI preparedness does not depend solely on individual teachers' personal access or initiative.

## CONCLUSION

This study examined the self-reported preparedness of public secondary school teachers in Gusau metropolis for AI-mediated classrooms. Teachers reported high preparedness and professional confidence, alongside moderate AI-related skills gaps and ethical concerns. Regression results showed that professional confidence was positively associated with preparedness, whereas skills gaps and ethical concerns were negatively associated with it; together, the three predictors explained 46% of the variance. The findings do not establish causation, but they indicate that teacher preparedness is better understood as a combination of perceived capability, confidence, and responsible-use concerns than as simple willingness to adopt technology. For secondary education, professional development and policy should therefore strengthen AI-specific pedagogy while also supporting confidence, ethical literacy, learner protection, and human oversight.

### Recommendations

**1.** Professional development for secondary school teachers should include subject-relevant AI pedagogy, output evaluation, lesson integration, and data literacy rather than focusing only on basic tool use.

**2.** Teacher training should include applied AI ethics, particularly data privacy, algorithmic bias, transparency, academic integrity, and maintenance of teacher autonomy and human oversight.

**3.** School leaders and policymakers should establish clear institutional guidelines for

responsible AI use in teaching, assessment, and the handling of learner data.

**4.** Schools should use mentoring, peer collaboration, and professional learning communities to provide repeated practice that can convert confidence into dependable classroom competence.

**5.** Education authorities should support equitable access to infrastructure, approved AI tools, and continuing professional development across public secondary schools.

## Limitations and Suggestions for Future Research

The study has four main limitations. First, its cross-sectional design does not permit causal inference. Second, the data were self-reported, creating the possibility of social-desirability and common-method bias. Third, professional confidence and preparedness are conceptually related, and the study did not conduct factor-analytic validation to establish their empirical distinctiveness beyond expert content review and internal-consistency estimates. Fourth, the study was conducted in one metropolitan public-school setting, which limits generalizability to other regions, school types, and education levels. Future research should use longitudinal or experimental designs where appropriate, combine self-report with performance-based measures of AI competence and classroom observation, conduct exploratory and confirmatory factor analyses of the instrument, and compare secondary teachers across regions and school contexts. Mixed-methods work could also examine how leadership support, school culture, infrastructure, and policy clarity shape the relationship between confidence, ethical concern, skills, and preparedness.

## Declarations

Ethics and consent: Ethical approval was obtained from the Federal College of Education (Technical), Gusau Research and Publication Ethics Committee (Approval No. FCETG/RPEC/26/013). Permission was obtained from the relevant school authorities, participation was voluntary, informed consent was obtained from all participants, and anonymity and confidentiality were maintained.

Conflict of interest: The authors declare that they have no conflict of interest.

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