

Teacher Readiness for Human-Centred AI Integration in Higher Education: Evidence from Assam, India

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Abstract

Generative artificial intelligence (GenAI) is transforming higher education, making teacher readiness essential for responsible integration. This paper proposes an empirical framework to examine higher education teachers' readiness for human-centred AI integration in Assam. Based on UNESCO's AI Competency Framework for Teachers, the study focuses on five dimensions: human-centred mindset, AI ethics, AI foundations and applications, AI pedagogy, and AI-supported professional learning, alongside institutional support. A quantitative, cross-sectional survey design is proposed, employing a structured questionnaire and statistical analyses to assess readiness and its influencing factors. Addressing a regional research gap, the study emphasises ethical judgment, pedagogical competence, and human accountability rather than technological adoption alone. As primary data collection is pending, the framework provides a basis for future empirical investigation. The anticipated findings may inform faculty development, institutional AI policies, and responsible AI integration in higher education.

Keywords: Artificial Intelligence, Generative AI, Teacher Readiness, Higher Education, Human-Centred AI, AI Literacy, AI Pedagogy, Assam, India

1. Introduction

Artificial intelligence (AI) has become an important part of higher education, influencing teaching, assessment, research, and academic communication. The emergence of generative artificial intelligence (GenAI) has further expanded its applications by enabling teachers and students to generate learning materials, explanations, feedback, and academic content (Kasneci et al., 2023). However, its increasing use raises concerns regarding accuracy, bias, privacy, academic integrity, and excessive dependence on technology. These challenges highlight the need for responsible and human-centred AI integration (UNESCO, 2023).

Teachers play a crucial role in ensuring that AI supports rather than replaces meaningful teaching and learning. Their readiness extends beyond technical skills to include pedagogical competence, ethical awareness, critical thinking, and professional judgment. UNESCO's AI Competency Framework for Teachers identifies five essential dimensions: human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI-supported professional learning (Miao & Cukurova, 2024). Recent studies also emphasise the importance of professional competence and institutional support in determining teachers' preparedness for AI integration (Kim et al., 2026; Luo & Day, 2026).

In India, the National Education Policy 2020 recognises the growing significance of AI and digital technologies in education while promoting innovation, critical thinking, and technology-enabled learning (Ministry of Education, 2020). However, differences in institutional resources, infrastructure, training opportunities, and digital competence may influence teachers' ability to integrate AI effectively. In Assam, higher education institutions operate across diverse geographical and institutional settings, making teacher preparedness and institutional support particularly important. Although research on AI in higher education is expanding, context-specific evidence concerning teachers' multidimensional AI readiness in Assam remains limited (Bond et al., 2024). Therefore, the present study examines teachers' readiness for human-centred AI integration across ethical, technological, pedagogical, and professional-learning dimensions, while considering the role of institutional support in promoting responsible AI use in higher education.

1.2 Research Questions

RQ1. What is the overall level of AI readiness among higher education teachers in Assam across the five dimensions of human-centred AI readiness?

RQ2. To what extent and for what academic purposes do higher education teachers use GenAI tools?

RQ3. What major opportunities and risks do teachers perceive regarding GenAI integration in higher education?

RQ4. Does teacher AI readiness differ according to selected professional and institutional characteristics?

RQ5. What relationship exists between institutional support and teacher AI readiness?

RQ6. Which factors significantly predict teachers' readiness for human-centred AI integration?

1.3 Objectives of the Study

1. To assess the overall level of AI readiness among higher education teachers in Assam across the five dimensions of human-centred AI readiness.
2. To examine the extent and academic purposes of GenAI use among higher education teachers.
3. To investigate teachers' perceptions of the major opportunities and risks associated with GenAI integration.
4. To compare teacher AI readiness across selected professional and institutional characteristics.
5. To examine the relationship between institutional support and teacher AI readiness.
6. To identify significant predictors of teachers' readiness for human-centred AI integration.

1.4 Hypotheses

H1: Institutional support is positively associated with overall teacher AI readiness.

H2: Prior AI-related professional development is associated with higher AI readiness.

H3: Frequency of purposeful GenAI use is positively associated with AI foundations/application competence and AI-pedagogical readiness.

H4: AI knowledge and application competence positively predicts AI-pedagogical readiness.

H5: Ethical AI readiness and human-centred orientation make distinct contributions to responsible integration beyond technical competence.

1.5 Statement of the Problem

The rapid expansion of generative artificial intelligence (GenAI) is transforming higher education, creating new opportunities for teaching, assessment, and research while raising concerns about accuracy, privacy, bias, and academic integrity (Kasneci et al., 2023). Effective AI integration requires more than

technical skills; it involves ethical awareness, pedagogical competence, human-centred thinking, and professional judgment (Miao & Cukurova, 2024).

Although recent studies have explored faculty readiness and GenAI adoption (Kim et al., 2026; Luo & Day, 2026), limited empirical evidence exists regarding the multidimensional AI readiness of higher education teachers in Assam. Therefore, the present study examines teachers' readiness across ethical, technological, pedagogical, and professional-learning dimensions, along with the role of institutional support in promoting responsible AI integration.

1.6 Conceptual Framework

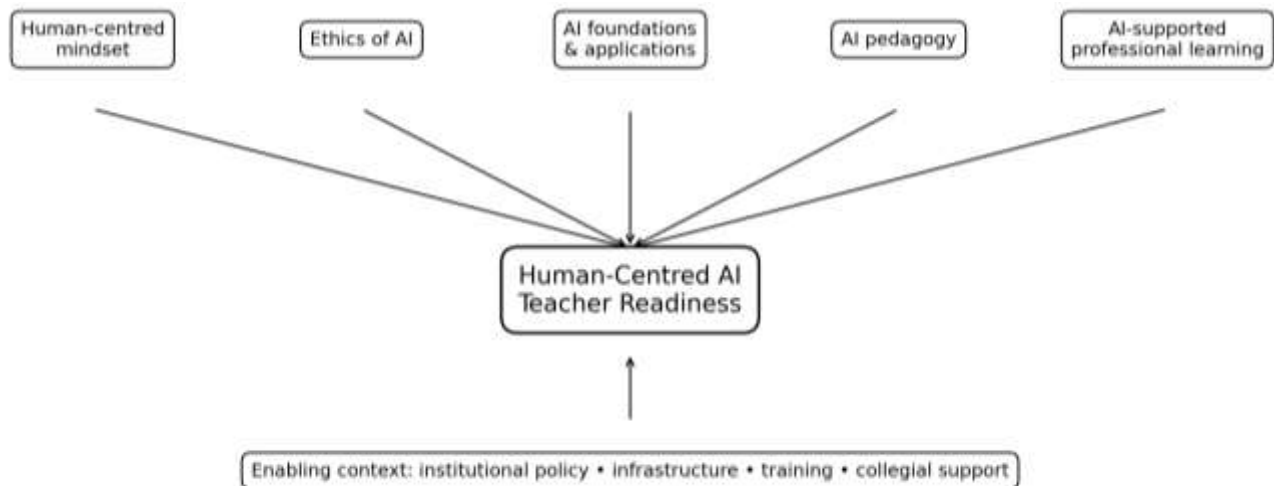


Figure 1. Proposed conceptual framework for human-centred teacher AI readiness.

The proposed model treats the five UNESCO-aligned competencies as interrelated dimensions of teacher readiness. Institutional policy, infrastructure, training and collegial support from the enabling context. The model assumes that technical competence alone is insufficient: responsible integration emerges when knowledge of AI is combined with ethical judgment, human agency, pedagogical competence and continuing professional learning.

1.6 Operational dimensions of teacher readiness

Table 1

Dimension	Meaning in this study	Illustrative indicators	Primary basis
Human-centred mindset	Maintaining human agency and accountability	Teacher judgment, proportional use, inclusion, learner welfare	UNESCO, 2024
Ethics of AI	Safe, fair and transparent use	Bias, privacy, attribution, disclosure, data protection	UNESCO, 2024; Kasneci et al., 2023
AI foundations & applications	Functional AI literacy and tool competence	Limitations, verification, prompting, tool selection	UNESCO, 2024
AI pedagogy	Purposeful integration into teaching and	Learning alignment, feedback, assessment	UNESCO, 2024

	assessment	redesign, critical use	
AI-supported professional learning	Using AI to strengthen continuing professional development	Reflection, resource discovery, peer learning, experimentation	UNESCO, 2024
Institutional support	Conditions enabling responsible practice	Policy clarity, infrastructure, training, approved tools, leadership	Luo & Day, 2026

1.7 Ethical Considerations

- **Informed consent:** Participants will be informed about the purpose and nature of the study before providing consent.
- **Voluntary participation:** Participation will be completely voluntary, with the right to withdraw at any stage without penalty.
- **Anonymity:** Personally identifiable information will not be disclosed in the research findings.
- **Confidentiality:** Participants' responses will be kept confidential and used only for academic and research purposes.
- **Data protection:** Collected data will be stored securely and accessed only by the researcher or authorised research team.
- **Institutional permission:** Necessary approval or permission will be obtained from the concerned institutions or ethics committee, where applicable.
- **Non-evaluative approach:** Responses regarding AI use will not be used to judge participants' professional competence or job performance.
- **Research integrity:** Data will be analysed and reported accurately without fabrication, manipulation, or selective reporting.
- **Responsible use of AI:** Any AI-assisted research activity will remain under human supervision and will follow privacy, confidentiality, and academic-integrity requirements.

2. Literature Review

2.1 AI and Generative AI in Higher Education

Artificial intelligence has been widely used in higher education for assessment, prediction, adaptive learning, personalisation, and intelligent tutoring (Zawacki-Richter et al., 2019). Generative AI (GenAI) has further expanded these applications through content creation, feedback, and educational support. However, concerns regarding accuracy, bias, privacy, academic integrity, and overdependence remain significant (Kasneci et al., 2023; Tlili et al., 2023). UNESCO (2023) emphasises human-centred AI integration that promotes inclusion, transparency, human agency, and data protection.

2.2 Teacher Readiness and Human-Centred AI

Teacher AI readiness involves technological knowledge, ethical awareness, pedagogical competence, and professional judgment. Studies highlight the influence of professional development and institutional conditions on readiness (Kim et al., 2026; Luo & Day, 2026). UNESCO's AI Competency Framework identifies five dimensions: human-centred mindset, AI ethics, AI foundations and applications, AI pedagogy, and professional learning (Miao & Cukurova, 2024). These competencies enable teachers to integrate AI responsibly while maintaining human oversight.

2.3 Ethical and AI Application Competence

Ethical AI readiness requires awareness of privacy, bias, misinformation, transparency, intellectual property, and academic integrity (Tlili et al., 2023; UNESCO, 2023). Teachers must protect confidential information, verify AI-generated content, and ensure responsible use. Functional AI literacy also involves understanding AI capabilities and limitations, effective prompting, critical evaluation, information verification, and appropriate tool selection (Kim et al., 2026; Miao & Cukurova, 2024).

2.4 AI Pedagogy and Professional Learning

Effective AI integration requires combining technological, pedagogical, and subject knowledge, as emphasised by the TPACK framework (Mishra & Koehler, 2006). Teachers must align AI applications with learning outcomes, support critical thinking, provide meaningful feedback, and redesign assessments (Kasneci et al., 2023). Continuous professional learning through AI-assisted resource exploration, reflection, preparation, and collaborative training is essential for developing responsible pedagogical practices (Miao & Cukurova, 2024; Luo & Day, 2026).

2.5 Institutional Support for AI Integration

Institutional support plays a significant role in teacher AI readiness. Effective integration requires adequate infrastructure, clear AI policies, professional development, privacy and academic-integrity guidelines, and support for teaching and assessment redesign (Luo & Day, 2026; UNESCO, 2023). Thus, responsible AI integration depends on both individual teacher competence and supportive institutional conditions (Miao & Cukurova, 2024).

2.6 Research Gap

Recent studies demonstrate increasing attention to faculty perceptions, practices, and readiness for GenAI in higher education (Baggia et al., 2026; Kim et al., 2026; Luo & Day, 2026). Emerging research also connects teacher readiness with human-centred AI and institutional quality assurance (AlMandhari et al., 2026). However, AI readiness is shaped by institutional resources, professional development, disciplinary context, technological access, and local educational conditions.

Despite the growing international literature, limited empirical evidence is available on the multidimensional readiness of higher education teachers in Assam and Northeast India. Existing studies do not adequately explain how human-centred orientation, ethical readiness, AI competence, pedagogical readiness, professional learning, and institutional support interact within this regional context. The present study addresses this gap by examining these dimensions among higher education teachers in Assam.

3. Methodology

3.1 Research Approach and Design

The study adopted a quantitative, descriptive and correlational cross-sectional survey design to assess teacher AI readiness and examine its relationships with institutional support, AI use, technological competence, ethical awareness, human-centred orientation, and pedagogical readiness.

3.2 Population of the Study

The target population consisted of teachers working in recognised higher education institutions in Assam, including universities and colleges. Teachers from different academic disciplines, institutional settings, levels of teaching experience, and geographical locations were considered to obtain a diverse representation of the higher education sector.

3.3 Sample and Sampling Technique

A sample of approximately 450 higher education teachers is proposed, using multistage stratified sampling to ensure representation from universities and colleges across urban, semi-urban, and rural areas, covering humanities, social sciences, sciences, education, commerce, management, and other professional disciplines.

3.4 Research Instrument

Data were collected using a structured questionnaire titled Teacher Readiness for Human-Centred AI Integration Questionnaire (TRHCAI-Q), based on UNESCO's AI Competency Framework for Teachers (Miao & Cukurova, 2024) and relevant literature on AI readiness, ethics, and pedagogy.

The questionnaire comprised eight sections:

- **Section A: Demographic and Professional Information:** Institution type, discipline, teaching experience, location, and prior AI training.
- **Section B: AI Exposure and Purposeful GenAI Use:** Frequency and purposes of AI use in teaching, assessment, research, feedback, academic writing, professional learning, and administration.
- **Section C: Human-Centred Mindset:** Human agency, professional judgment, inclusion, learner welfare, and accountability.
- **Section D: Ethical AI Readiness:** Privacy, bias, transparency, misinformation, intellectual property, academic integrity, and responsible use.
- **Section E: AI Foundations and Application Competence:** AI capabilities, limitations, prompting, tool selection, critical evaluation, and verification.
- **Section F: AI-Pedagogical Readiness:** Integration of AI into learning objectives, teaching strategies, feedback, assessment, and critical thinking.
- **Section G: AI-Supported Professional Learning:** AI-assisted professional development, reflection, resource exploration, and teaching improvement.
- **Section H: Institutional Support:** AI policies, infrastructure, resources, training, leadership, and institutional guidance.

3.5 Measurement Scale

The major readiness items were measured using a five-point Likert scale, as follows:

1 = Strongly Disagree

2 = Disagree

3 = Neutral

4 = Agree

5 = Strongly Agree

Higher scores represented stronger perceived readiness or institutional support. Appropriate reverse scoring was applied if negatively worded items are included.

3.6 Validity of the Instrument

The questionnaire underwent content and face validation by experts in teacher education, educational technology, research methodology, higher education, and AI. The review focused on item relevance, clarity, alignment with study objectives, construct coverage, contextual suitability in Assam, and potential ambiguity or duplication.

3.7 Pilot Study and Reliability

A pilot study was conducted with 30–50 higher education teachers excluded from the final sample. Reli-

ability was assessed using Cronbach's alpha, McDonald's omega (where feasible), and item-total correlations. Items with weak statistical performance were reviewed for revision or removal based on statistical and conceptual considerations.

3.8 Data Collection Procedure

After obtaining institutional permission, the questionnaire was administered online, offline, or through mixed modes. Participants were informed about the study's purpose, voluntary participation, confidentiality, and data use, and informed consent was obtained.

3.9 Variables of the Study

The key variables included overall AI readiness and its five dimensions, institutional support, purposeful GenAI use, and prior AI training. Institutional support and AI use served as explanatory variables, while AI readiness and its dimensions were treated as outcome variables.

3.10 Statistical Analysis

Data were analysed using IBM SPSS Statistics. Descriptive statistics (frequency, percentage, mean, SD, and 95% confidence intervals) assessed teacher characteristics and AI readiness. Cronbach's alpha and McDonald's omega measured reliability. Pearson correlation examined relationships among variables, while independent-samples t-tests and one-way ANOVA assessed group differences, with effect sizes and post-hoc tests where appropriate. Linear and multiple regression identified predictors of readiness, while hierarchical regression examined the additional contributions of ethical and human-centred competencies beyond technical competence. Statistical significance was set at $p < .05$, with effect sizes, confidence intervals, and R^2 measures reported where applicable.

3.11 Hypothesis-Wise Statistical Analysis

Table: Hypothesis-Wise Statistical Analysis

Hypothesis	Variables	Statistical Tool/Test	Purpose
H1: Institutional support is positively associated with overall AI readiness.	Institutional support; Overall AI readiness	Pearson correlation and linear regression	To determine the strength of association and whether institutional support significantly predicts overall AI readiness.
H2: Teachers with prior AI professional development demonstrate higher AI readiness.	Prior AI training (Yes/No); Overall AI readiness	Independent-samples t-test and Cohen's d	To compare mean readiness scores of trained and untrained teachers and estimate the magnitude of the difference.
H3: Purposeful GenAI use is positively associated with AI application competence and AI-pedagogical readiness.	Purposeful GenAI use; AI application competence; AI-pedagogical readiness	Pearson correlation and regression analysis	To examine whether purposeful GenAI use is related to and predicts technical and pedagogical readiness.
H4: AI foundations/application	AI foundations/application	Linear regression	To determine the extent to which AI

competence positively predicts AI-pedagogical readiness.	competence; AI-pedagogical readiness		application competence predicts teachers' pedagogical readiness.
H5: Ethical readiness and human-centred orientation contribute to overall readiness beyond technical competence.	Technical competence; Ethical readiness; Human-centred mindset; Overall AI readiness	Hierarchical multiple regression	To test whether ethical and human-centred competencies explain additional variance in readiness beyond technical competence.

Note. Statistical significance may be evaluated at $p < .05$. Effect sizes, confidence intervals, R^2 , adjusted R^2 , and ΔR^2 should also be reported where appropriate.

3.12 Methodological Alignment

The methodology combines descriptive, correlational, comparative, and predictive analyses to assess teacher AI readiness, its dimensions, and the influence of professional development, ethical awareness, and human-centred competencies beyond technical skills. It aligns with the multidimensional AI competency framework of Miao and Cukurova (2024) and supports the study of responsible AI integration in Assam's higher education institutions.

4. Illustrative Analysis of Simulated Data

The proposed methodology uses a quantitative, descriptive and correlational cross-sectional design. Accordingly, the illustrative analysis combines descriptive statistics with inferential procedures aligned to the five hypotheses. The simulated dataset contains 450 cases and uses five-point Likert-type composite scores for the major readiness dimensions. Higher scores represent stronger readiness or institutional support.

4.1 Descriptive Analysis of Major Constructs

Construct	N	Mean	SD	Interpretation
Human-centred mindset	450	3.62	0.58	Relatively high
Ethical AI readiness	450	3.55	0.61	Relatively high
AI foundations/application competence	450	3.41	0.67	Moderate-high
AI-pedagogical readiness	450	3.32	0.65	Moderate
AI-supported professional learning	450	3.46	0.63	Moderate-high
Institutional support	450	3.18	0.72	Moderate
Purposeful GenAI use	450	3.37	0.70	Moderate
Overall AI readiness	450	3.47	0.52	Moderate-high

The illustrative results show the highest readiness in human-centred mindset ($M = 3.62$, $SD = 0.58$) and ethical AI readiness ($M = 3.55$, $SD = 0.61$), while AI-pedagogical readiness ($M = 3.32$, $SD = 0.65$) and institutional support ($M = 3.18$, $SD = 0.72$) scored lower. If confirmed by actual data, these findings

would suggest a gap between teachers' awareness of responsible AI and its practical integration, highlighting the need for stronger institutional support.

4.2 Hypothesis Testing

H1: Institutional Support and Overall AI Readiness

Illustrative Pearson correlation showed a moderate positive relationship between institutional support and overall AI readiness ($r = .48$, 95% CI [.40, .55], $p < .001$). Regression analysis confirmed a significant association ($\beta = .48$, $R^2 = .23$), explaining 23% of the variance. H1 was supported in the illustrative analysis, highlighting the importance of institutional policies, infrastructure, and professional support.

H2: Prior AI Professional Development and Overall Readiness

Teachers with prior AI training ($n = 198$, $M = 3.68$) demonstrated higher readiness than those without training ($n = 252$, $M = 3.31$). The difference was statistically significant, $t(448) = 8.00$, $p < .001$, with a substantial effect size ($d = 0.76$). H2 was supported in the simulated data, suggesting an association between professional development and readiness, without establishing causation.

H3: Purposeful GenAI Use, Application Competence, and Pedagogical Readiness

Purposeful GenAI use was positively correlated with AI application competence ($r = .55$) and pedagogical readiness ($r = .46$), both $p < .001$. Regression explained 30% and 21% of their respective variances. H3 was supported in the illustrative analysis, indicating that AI use relates more strongly to technical competence than pedagogical integration.

H4: AI Application Competence and Pedagogical Readiness

AI application competence significantly predicted pedagogical readiness ($\beta = .61$, $p < .001$), explaining 37% of the variance ($R^2 = .37$). H4 was supported in the illustrative analysis, suggesting that technical competence is important but insufficient without pedagogical and institutional support.

H5: Ethical and Human-Centred Competencies Beyond Technical Competence

Hierarchical regression showed that technical competence initially explained 27% of overall readiness ($R^2 = .27$). Adding ethical readiness and human-centred mindset increased the explained variance to 52% ($R^2 = .52$, $\Delta R^2 = .25$, $p < .001$). All three predictors remained significant: technical competence ($\beta = .31$), ethical readiness ($\beta = .34$), and human-centred mindset ($\beta = .29$). H5 was supported in the illustrative analysis, demonstrating the additional explanatory value of ethical and human-centred competencies.

5. Major Findings

- The overall illustrative AI readiness score is moderate-to-high ($M = 3.47$), indicating neither very low readiness nor complete preparedness.
- Human-centred mindset emerges as the strongest dimension, suggesting that retaining human agency and professional responsibility may be a relative strength.
- Ethical AI readiness is also comparatively strong, indicating awareness of responsible-use concerns such as verification, privacy, bias, transparency and academic integrity.
- AI-pedagogical readiness is weaker than human-centred and ethical readiness, suggesting a possible gap between awareness of AI and the ability to redesign teaching, learning and assessment around it.
- Institutional support is comparatively weaker, indicating that policy, infrastructure, leadership guidance and organised professional development may require greater attention.

- Institutional support is moderately and positively associated with overall AI readiness and explains a meaningful proportion of its variance.
- Teachers with prior AI-related professional development show substantially higher illustrative readiness than teachers without such training.
- Purposeful GenAI use is associated with both application competence and pedagogical readiness, with the stronger association occurring for application competence.
- AI application competence is a strong predictor of AI-pedagogical readiness, but it does not explain pedagogical readiness completely.
- Ethical readiness and human-centred mindset add substantial explanatory power beyond technical competence, supporting a multidimensional understanding of teacher AI readiness.

6. Discussion

6.1 A Multidimensional Pattern of Teacher Readiness

The illustrative findings suggest that AI readiness extends beyond technical skills. Teachers may demonstrate stronger ethical awareness and human-centred values while remaining less prepared for pedagogical integration. This aligns with UNESCO's multidimensional AI Competency Framework for Teachers (Miao & Cukurova, 2024).

6.2 Institutional Conditions Matter

The H1 results highlight the importance of institutional support, including infrastructure, policies, training, and leadership. If confirmed empirically, AI readiness should be considered a shared institutional responsibility rather than solely an individual competence.

6.3 Professional Development as a Readiness Mechanism

The H2 findings suggest a positive association between AI training and teacher readiness. Professional development should extend beyond technical skills to include ethical practices, critical verification, academic integrity, assessment design, and discipline-specific applications.

6.4 From AI Use to AI Pedagogy

The H3 and H4 results suggest that purposeful AI use strengthens application competence and pedagogical readiness. However, technical knowledge alone is insufficient for effective teaching, supporting the TPACK framework's emphasis on integrating technology, pedagogy, and content (Mishra & Koehler, 2006).

6.5 Ethics and Human Agency as Core Components

The H5 results show that technical competence explained 27% of readiness, increasing to 52% when ethical and human-centred competencies were included. This illustrates the importance of ethical judgment, critical evaluation, learner protection, and human responsibility in AI-supported education.

6.6 Implications for Higher Education in Assam

Higher education institutions in Assam differ in resources, location, and training opportunities. AI integration therefore requires context-specific faculty development, clear institutional guidelines, multilingual support, and equitable access to digital infrastructure.

6.7 Implications for Policy and Practice

The findings suggest three priorities: clear institutional AI policies addressing privacy and academic integrity, continuous professional development integrating ethical and pedagogical competencies, and opportunities for supervised experimentation and collaborative learning.

7. Overall Interpretation

The illustrative findings suggest uneven AI readiness among higher education teachers, with stronger human-centred and ethical orientations but comparatively weaker pedagogical readiness and institutional support. Professional development, purposeful AI use, and technical competence are positively associated with readiness, while ethical judgment and human agency provide additional explanatory value.

Overall, responsible AI integration requires a balanced combination of technological, pedagogical, ethical, and institutional competencies. These interpretations remain provisional until validated through actual field data from higher education teachers in Assam.

8. Limitations

The proposed design is cross-sectional and therefore cannot establish causal change in readiness. Self-report measures may overestimate competence, especially where respondents confuse frequent use with skilled use. The study should therefore consider adding scenario-based or performance items in future work. A survey of Assam cannot automatically represent all Indian higher education contexts. Rapid technological change also means that tool-specific questions can become outdated quickly; construct-focused items are preferable. Finally, institutions willing to participate may already be more interested in AI, creating potential selection bias.

9. Conclusion

Human-centred AI integration in higher education requires more than technological access. It demands teachers' technical, ethical, and pedagogical competence, supported by institutional policies, infrastructure, and professional development. An Assam-based study can address a regional research gap by examining readiness as the ability to use AI critically, responsibly, and effectively while maintaining human accountability. Once validated through primary data, the proposed framework can guide faculty development and institutional strategies for responsible AI integration.

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