A Multi-Dimensional Analysis of Prospective Teachers' Attitudes towards Artificial Intelligence: Evaluating Utility, Accessibility, and Implementation Concerns

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Abstract: This study underscores a multi-dimensional analysis of prospective teachers' attitudes towards Artificial Intelligence in educational practices. Specifically elucidates on the utility, accessibility, and implementation concerns. Using 36 items validated multi-dimensional scale with a diverse sample of 120 prospective teachers. Findings clearly indicate a high existing adoption rate, with 73.1% of participants utilizing AI tools for study purposes. Despite this a marginal attitudinal disparity is observed as only 67% plan artificial intelligence for future classroom integration. Dimension-wise analysis reveals that while Accessibility and Convenience (M=4.35, SD=0.59) and Future Intentions (M=4.21, SD=0.60) are highly favorable, Engagement and Interaction resulted in the lowest scores (M=3.42, SD=0.81). AI has high Perceived Utility (M=4.12) among future teachers, on the other hand. Socio-Ethical Concerns (M=3.89, SD=0.73) because of ethical implementation, algorithmic bias, and the dehumanization of the teaching-learning process. Addressing these issues; urgent need of teacher education programs to mitigate "Utility-Anxiety Paradox" and transition from basic technical awareness to AI literacy, ensuring future educators are prepared to navigate the technologically enriched learning environments.

Keywords: Artificial Intelligence, Prospective Teachers' Attitude, Multi-dimensional Analysis.

Introduction

The global education sector is undergoing a profound transformation with the emergence of artificial intelligence (AI)–enabled ecosystems. These ecosystems are reshaping how knowledge is delivered, assessed, and personalized, marking a shift from traditional pedagogical models toward adaptive, technology-driven approaches.'' In alignment with Sustainable Development Goal 4, which highlights ''the global commitment to ensuring equitable access to quality education and lifelong learning opportunities." (United Nations, 2015).The integration of AI is increasingly viewed as a catalyst for achieving educational equity and innovation in the 21st century. AI-driven tools such as intelligent tutoring systems, predictive analytics, and adaptive learning platforms are redefining the contours of teaching and learning by offering personalized pathways, real-time feedback, and scalable solutions (Hariyanto et al., 2025; Joshi, 2023). In Indian context, the National Education Policy (NEP, 2020) underscores the importance of cultivating a technological mindset among educators. It advocates a decisive move away from rote memorization toward competency-based, AI-supported models that emphasize creativity, problem-solving, and digital fluency (Ministry of Human Resource Development, 2020).This policy direction reflects a broader recognition that infrastructure alone cannot guarantee successful AI integration; rather, the dispositions and attitudes of educators serve as the decisive factor in determining whether AI is embraced as a pedagogically or resisted as a disruptive force (UNICEF, 2020).

Prospective teachers are nexus in this metamorphosis from traditional instruction to radical shift in pedagogy and class dynamics as they considered as the ''gatekeepers' of future-ready classroom. The successful integration of AI is not solely a matter of infrastructure along with the attitude of future ready teachers. This study elucidates attitude of prospective teachers through five specific dimensions: Utility Accessibility, Engagement, Challenges, and Intentions along with implementations concern and function as primary predictors of AI adoption. These dimensions are critical to understand as they illuminate not only the opportunities but also underscore the barriers of its effective implementation. ''The foundation of successful AI integration lies in the interplay between three; technology, pedagogy, and content. Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge (TPACK) framework suggests that for prospective teachers to be effective "gatekeepers," they must possess more than just technical skill. They must understand how AI (Technological Knowledge) interacts with specific teaching strategies (Pedagogical Knowledge) and

the subject matter (Content Knowledge).''This study mainly investigates prospective teachers' attitudes toward AI integration while also considering practical concerns related to implementation and this research contributes to ongoing debates on digital pedagogy along with teacher preparedness, and the sustainable embedding of artificial intelligence in educational practice.

Review of Literature

Artificial Intelligence into education is the fulcrum of global researches. Current studies consistently affirm that the positive attitudes of Prospective teachers towards Perceived Usefulness of AI remains the strongest dimensions, Celik, (2023) described AI as a "Co-pilot" for lesson planning and personalized instruction. This aligns with broader findings that adaptive learning technologies enhance efficiency and foster learner autonomy (Hariyanto, Nugroho, & Setiawan, 2025; Joshi, 2023).Although Dehumanization Concern is very popular among teachers, over 70% of participants in recent studies express fear that AI-based learning lacks the emotional intelligence necessary for meaningful interaction (MDPI, 2025). Furthermore, "Ethical Anxiety" regarding algorithm bias and misinformation (Al Darayseh, 2023) acts as a significant negative predictor of AI adoption. UNICEF (2020) similarly emphasizes that equitable access and ethical safeguards are essential for AI to advance Sustainable Development Goal 4. STEM teachers demonstrating substantially higher acceptance levels ($t = 3.21$, $p < 0.01$) compared to their humanities counterparts Joshi & Desai (2023). Findings of a longitudinal intervention study revealed a 21% improvement in attitudes following a three-month training program, highlighting that sustained educational initiatives are most effective in fostering positive changes. Kumar & Nair (2022).AI is widely recognized for automating routine tasks such as grading, attendance, and feedback, thereby allowing teachers to focus on pedagogy (Napte & Singh, 2025).Adaptive AI systems provide individualized instruction, improving student engagement and achievement (Ofem et al., 2025). AI-driven analytics enable assessment support, real-time monitoring of student progress, which prospective teachers perceive as a valuable utility for formative evaluation. Despite of AI usefulness, concerns of over-reliance scholars caution that excessive dependence on AI may undermine teacher autonomy and critical judgment (MDPI, 2025). AI technologies can support equity and inclusion of diverse learners including those with disabilities, through translation, text-to-speech and adaptive tools (Melo-López et al., 2025).Accessibility is uneven across contexts. Waseem et al. (2025) highlights that while awareness of AI is growing under NEP 2020 in India, disparities in digital infrastructure and teacher training hinder equitable adoption. Rural and resource-constrained settings face challenges in accessing AI tools, limiting their perceived usefulness among prospective teachers. Springer (2025) emphasizes that professional development and accurate information reduce misconceptions, fostering positive attitudes toward AI. Ethical and technical challenges, including bias, reliability, and autonomy, remain significant barriers (Al Darayseh,2023; NEP, 2020).

Conceptual Framework of the Study

The conceptual framework illustrated that prospective teachers' Attitude toward Artificial Intelligence and highlights it a multidimensional Stance interconnected with three dimensions; utility, accessibility, and implementation concerns

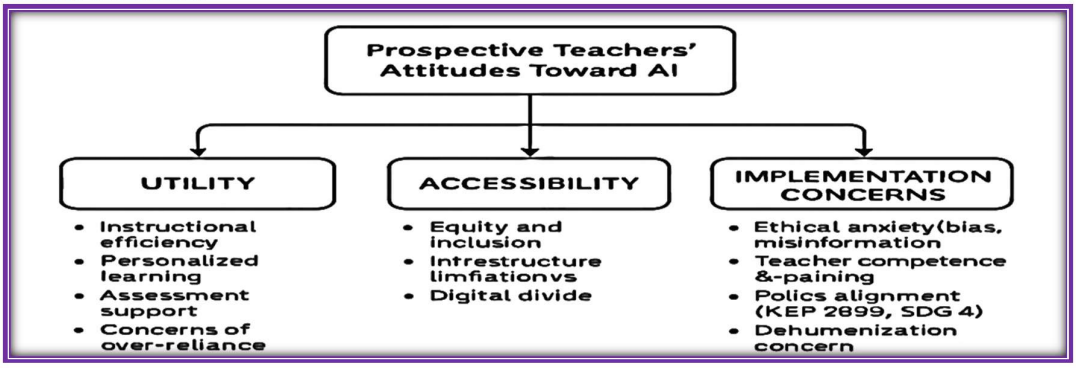


Figure1. Illustrating the conceptual framework of the study

Sources: Designed by Authors (2026)

This diagram conceptualizes prospective teachers' attitudes toward artificial intelligence across multi-dimensions, mainly Utility, Accessibility, and Implementation Concern. Utility of Artificial Intelligence has potential to enhance instructional efficiency, inability and how they personalized learning, and support assessment processes. This favorable outlook is moderated by structural and accessibility hurdles; digital divide, infrastructure limitations that threaten equity and inclusion in the classroom. In addition implementation concerns about using artificial intelligence, like bias, wrong information, need of proper

teachers' training and alignment with NEP 2020 & SDG 4. Reflection of ethical anxiety between the desire for technological innovation and the fear of dehumanizing the educational experience to ensure its responsible and sustainable adoption**.**

Research Objectives

- To assess prospective teachers' attitude towards the usefulness of Artificial Intelligence in enhancing teaching and learning.
- To evaluate prospective teachers' views on the accessibility and ease of use of Artificial Intelligence tools in educational contexts.
- To examine prospective teachers' concerns regarding the implementation of Artificial Intelligence in classroom practice.
- To analyze prospective teachers' overall attitudes toward the adoption of Artificial Intelligence in their professional development and teaching practice.
- To explore variations in prospective teachers' attitudes towards Artificial Intelligence across demographic and disciplinary contexts

Research Questions

RQ1.What are prospective teachers' perceptions of the usefulness of AI in teaching and learning?

RQ3.What concerns do prospective teachers express about the implementation of AI in classroom practice?

RQ4.How do prospective teachers' overall attitudes reflect their readiness to adopt AI in teaching and professional development?

RQ 5.What demographic variations exist in prospective teachers' attitudes towards in prospective teachers' attitudes towards Artificial Intelligence across demographic and disciplinary contexts?

Research Methodology

This section presents the methodology employed to explore the multi-Dimensional analysis of the attitude of prospective teachers' towards artificial intelligence to evaluate utility, accessibility, and implementation concerns among prospective teachers enroll in different locations of India. The research methodology included the research design, population, sampling techniques, data collection methods, data analysis, and ethical considerations.

Research Design

A descriptive survey research design was adopted in this study. Creswell (2012) explains that survey designs are widely used in quantitative research to describe trends, attitudes, or opinions of a population by studying a sample. A quantitative survey was conducted to gather data to measure attitude of prospective teachers through multi dimensions.

Population and Sampling

The target population for the study consisted of prospective teachers enrolled at different geographic location of India. 120 prospective teachers were available for participation.

Sampling for Quantitative Data: A stratified random sampling technique was used to select a sample of teachers. The sample consisted 120 prospective teachers, ensuring that it was representative of various types of teachers training programs.

Methodology

Research Design and Sample

A quantitative survey-based research design was adopted. A quantitative descriptive survey design was adopted to describe trends and attitudes (Creswell, 2012).The population consists of prospective teachers (B.Ed. Students) selected via stratified random sampling to ensure representation across demographic and disciplinary contexts.

Instrumentation

The researcher employed a questionnaire designed with a Likert-Scale with five validated dimensions. as the primary tool for data collection. A Likert scale is a psychometric scale commonly used in survey research to measure perceptions, attitudes, and opinions. It allows respondents to indicate their level of agreement or disagreement with specific statements, thereby providing ordinal data that can be analyzed to reveal trends, attitudes, and alignment with the study's themes (Likert 1932; Boone & Boone, 2012).Dimensions are the following:

(D1).Perceived Usefulness :(Impact on professional skills).

(D2)Accessibility & Convenience :(Geographical reach and 24/7 availability)

(D3)Engagement & Interaction: (Quality of student-teacher dynamics)

(D4)Challenges & Concerns: (Reliability, bias, and autonomy)
(D5)Future Intentions & Adoption: (Readiness for curriculum integration)

Findings and Discussion

Table 1: Demographic Characteristics of Participants

Variable	Frequency	Percentage
Gender	**Female**	**69%**
	Male	**31%**
Subject Stream	**Arts**	**36.7%**
	Science	**50%**
	Commerce	**13.3%**
Type of Institution Enrolled In	**Government**	**30%**
	Private	70%
Do you use AI tools like Chat GPT,Co-pilot etc. teaching preparation and study purpose?	Yes	73.1%
	No	26.9%
Do you plan to use AI tools like Chat GPT ,Co-pilot etc. in your future teaching practice?	Yes	67%
	No	23%

Data obtained from Research Field (2026)

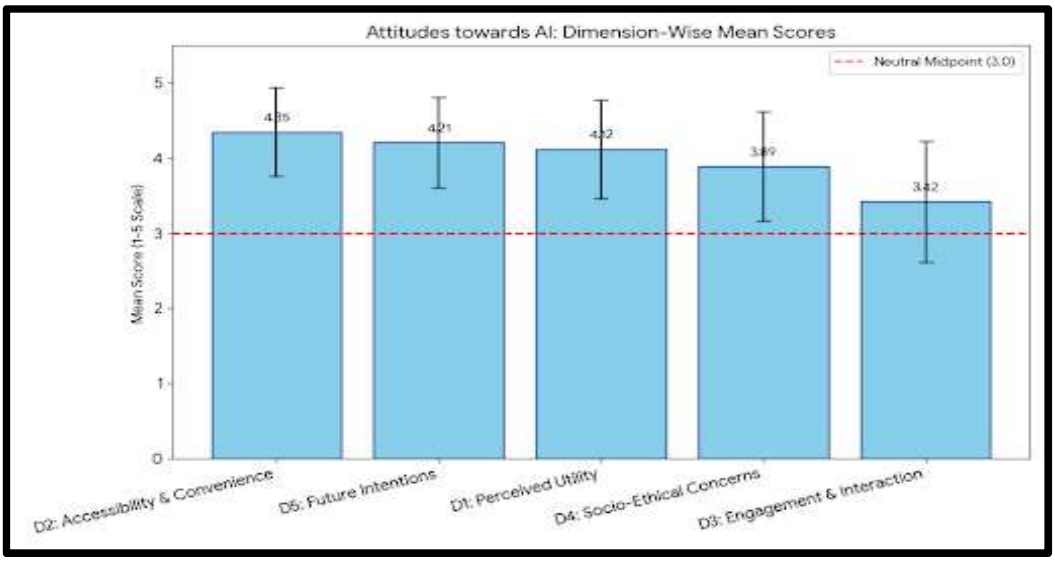
This table illustrates the demographic distribution of the 120 participants with a broad cross-section of the population of prospective teachers. Female majority (69%) reflects the typical gender ratio in the different teachers' training programs. This study reveals that Science Stream prioritized (50%) in the comparison of Arts (36.7%) and Commerce (13.3%).Moreover the private institutes (60%) has higher representation than govt. ones (30%), it clearly conveys the varying levels of institutional digital infrastructure. Although prospective teachers are utilized Artificial Intelligence tools in their individual studies but they cannot be effectively employed in teaching learning activities of classroom due to the lack of adequate infrastructure. Overall prospective teachers express their willingness (67%) for the adaptation of AI tools in future teaching practices and alignment with the goals of NEP 2020 and SDG 4.

Table 2: Attitudes towards Artificial Intelligence Dimension-Wise Likert Scale Analysis Table

Dimension	Item No.	Type of Items	Mean (Max 5.0)	S.D	Cronbach's α	Interpretation
D1:Perceived Utility	4	2 Positive, 2 Negative	4.12	0.66	0.85	Favorable
D2:Accessibility & Convenience	4	2 Positive, 2 Negative	4.35	0.59	0.72	Highly Favorable
D3:Engagement & Interaction	4	2 Positive, 2 Negative	3.42	0.81	0.69	Neutral to slightly favorable
D4:Socio-Ethical Concerns	4	2 Positive, 2 Negative	3.89	0.73	0.80	Favorable
D5:Future Intentions	4	3 Positive, 2 Negative	4.21	0.60	0.79	Favorable

Source: Data Obtained from Research Field (2026)

The descriptive analysis highlights multi-dimensional analysis of the attitudes of prospective teachers towards artificial intelligence and evaluating utility, accessibility, and implementation concerns.



Data obtained from Research Field (2026)

The table analysis attitude of prospective teachers towards Dimension-Wise Likert Scale Analysis reveals an overall positive disposition toward Artificial Intelligence, with an average mean score of approximately (4.00) across all dimensions.

Leading dimensions (Highest Scores)

Accessibility & Convenience (D2): This dimension scored the highest mean score (4.35%) and lowest S.D.(0.59) reflects artificial intelligence has positive influence that helps to access learning resources and bridging educational gaps, especially for diverse learners of remote areas. Optimism about AI's reach is tempered by infrastructural disparities, echoing Waseem et al. (2025) This is a clear indication of strong consistent agreement among prospective teachers that artificial intelligence based technologies are highly accessible and convenient to use.

Future Intentions (D5): There is a clear favorable outlook with (4.21) mean score and (0.60) S.D on the long-term adoption of artificial intelligence by prospective teachers. They are not just using artificial intelligence now but intend to continue in the future. These intentions are consistent with Melo-López et al. (2025), who found strong readiness among prospective teachers to adopt AI tools in classrooms. This optimism reflects global trends toward AI integration in education and supports NEP 2020 and SDG 4 goals of leveraging technology for inclusive, quality learning.

Perceived Utility (D1)

Prospective teachers generally considered the utility of artificial intelligence to enhance instructional efficiency and preparation for lesson. The relatively with high mean (4.12) and S.D. (0.66) aligns with the findings by Celik (2023), who emphasized that teachers perceive AI as a supportive tool for professional tasks, though not a complete substitute for pedagogical expertise. The moderate score suggests cautious optimism, consistent with Mishra & Koehler's (2006)

TPACK framework, which highlights the need for balanced integration of technology with pedagogy and content knowledge

Primary Areas of Concern (Lowest Scores)

Engagement & Interaction (D3): This is the lowest scoring dimension with (3.42) mean but the higher (**0.81**) S.D shows varied opinions and the highest level of disagreement among users with some respondents more open to use artificial intelligence in teaching-learning while others remain doubtful. It is a critical area where human presence is still considered irreplaceable. This is consistent with Hariyanto et al. (2025), who noted that while AI can personalize learning, it cannot replace relational aspects of teaching. The variability in their responses aligns Lariba & Ibojo's (2025) findings of mixed teacher perceptions about AI-mediated engagement.

Socio-Ethical Concerns (D4): This dimension is lower than Utility and Accessibility but still favorable with the mean score of (**3.89**) and (**0.73**) S.D. It is an evident that AI adoption is high but socio-ethical concerns still persists among the prospective teachers. Moderate concerns in responses align with Al Darayseh (2023), who documented ethical anxieties among educators regarding bias, misinformation, and privacy and differing levels of awareness, reinforces Springer (2025)'s recommendation for professional development to build ethical competence in AI use

Discussion

This study provides a multi-dimensional lens into the readiness of prospective teachers to navigate the artificial intelligence in pedagogy and highlight a complex interplay of favorable disposition and apprehension. There is a positive utility but high anxiety paradox among them. Overall mean score of all dimensions is 4.00.High mean scores in dimensions such as accessibility and future intentions indicate a robust readiness of prospective teachers to integrate Artificial Intelligence into teaching and learning preparation and alignment with the vision of NEP 2020 and SDG4.for competency based learning and global trends of AI enabled education system. On the other hand low score of engagement & interaction dimension has a profound fear that AI might be effect the interpersonal dynamics of the classroom. A strong willingness of prospective teachers to adopt AI tools indicates readiness for integration but some concerns are persist about biasness, misinformation, and autonomy mirror and global debates on the responsible use of artificial intelligence. The focus must shift to ethical literacy of AI in teacher training programs so ethical hesitant and challenges could be address and democratization of AI tool to bridge the gap for diverse learners. As UNESCO (2024) suggests that the teacher's role is evolving from a transmitter of knowledge to a curator of AI-driven experiences.

Recommendations

The findings of this study are proposed some recommendations for impactful educational change alignment of artificial intelligence in teacher education. It is extremely important for teacher's training institutes (B.Ed. Program) rather than delimiting of artificial intelligence to the computer lab; do more to integrate it in methodology and pedagogy across all the subjects. Code of ethics should develop by educational governing bodies for the use of artificial intelligence in classrooms to address the concerns identified like dehumanization of education. Govt. should arrange funding to demolish institutional digital disparity and equal access of artificial intelligence enabled ecosystem. It will train prospective teachers with a framework for identifying bias, privacy and safe use of technology into education and their professional development. In the stream wise comparison Science students has higher rate of acceptance than Commerce and humanities. Workshops and disciplinary specific AI training programs should be designed to demonstrate utility of AI as a co-pilot for teachers in all domains.

Conclusion

This multi-dimensional analysis of the prospective teachers' attitudes towards artificial intelligence concludes a major shift towards 'Technological Transition" in their professional training. They have thoughtful integration with caution because high level of "technology-driven optimism" intends adaptation of different AI tools but worried about dehumanization and have staunch faith in human interaction as a core of education and couldn't replace anyhow. This study reflects "Utility-Anxiety Paradox". It is a turning milestone in the context of Indian education to address pedagogical support and ethical literacy with the same urgency as technological promotion and empowerment of next gen teachers by using artificial intelligence in teaching learning process as a catalyst for equity, innovation and lifelong learning. It should be integrated as a core competency among teachers; future educators are empowered rather than replaced. Findings of this study highlights that ''Accessibility and Future Intentions'' are major driving force for the adoption of artificial intelligence whereas constrained by ''Engagement Concerns and Ethical Anxiety." Teacher education must transform to achieve aspiring goals of NEP 2020 for future classroom

References

1. Al Darayseh, A. (2023). Acceptance of artificial intelligence in education: Ethical anxiety and technical challenges. Journal of Educational Technology Systems.
2. Boone, H. N., & Boone, D. A. (2012). Analyzing Likert data. Journal of Extension, 50(2), 1–5.
3. Celik, I. (2023). Towards an intelligent-TPACK: An empirical study on teachers' professional knowledge to integrate artificial intelligence into education. British Journal of Educational Technology, 54(1), 167–184. https://doi.org/10.1111/bjet.13255
4. Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). SAGE Publications
5. Hariyanto, D., Nugroho, A., & Setiawan, R. (2025). Artificial intelligence in adaptive learning: A systematic review. Journal of Educational Technology Research, 18(2), 45–62. https://link.springer.com/article/10.1007/s44217-025-00908-6
6. Joshi, M. (2023). Artificial intelligence in the 21st century classroom: Innovation and equity. Academic Press.
7. Joshi, M., & Desai, S. (2023). Acceptance of AI among STEM and Humanities educators: A comparative analysis. International Journal of Digital Pedagogy.

8. Kumar, R., & Nair, S. (2022). Fostering positive attitudes toward AI: A longitudinal intervention study in teacher training. Journal of Teacher Education and Technology.
9. Lariba, C. F. V., & Ibojo, D. T. M. (2025). Teachers' attitudes towards the use of AI: A study of benefits, concerns and support needs. International Journal of Research and Innovation in Social Science, 9(3s), 5871–5876.
10. Likert, R. (1932). A technique for the measurement of attitudes. Archives of Psychology, 22(140), 1–55.
11. MDPI. (2025). Dehumanization concerns and emotional intelligence in AI-enabled ecosystems. Education Sciences.
12. Melo-López, L., et al. (2025). AI technologies for inclusive education: Supporting diverse learners and disabilities. Sustainability.
13. Ministry of Education. (2020). National Education Policy 2020. Government of India. https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf
14. Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054.
15. Napte, V., & Singh, R. (2025). Automating pedagogy: The role of AI in administrative and instructional efficiency. Future Education Journal.
16. Ofem, U., et al. (2025). AI-driven analytics for formative evaluation: Real-time monitoring in prospective teacher training. Journal of Adaptive Learning.
17. Springer. (2025). Professional development and the reduction of AI misconceptions in teacher education. Technology, Knowledge and Learning.
18. UNESCO. (2024). AI competency framework for teachers. https://unesdoc.unesco.org/ark:/48223/pf0000383671
19. UNICEF. (2020). Policy guidance on AI for children. https://www.unicef.org/innovation/reports/policy-guidance-ai-children
20. United Nations. (2015). Transforming our world: The 2030 Agenda for Sustainable Development. https://sdgs.un.org/goals
21. Waseem, M., et al. (2025). The digital divide and AI adoption: Evaluating infrastructure limitations under NEP 2020. Indian Educational Review.