Student Teachers' Perception on Artificial Intelligence-Enhanced Teaching and Learning in Schools

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Abstract

Artificial Intelligence enables machines to perceive, process, and respond to their environment autonomously, adapting their behaviour to achieve specific goals. In education, AI-based tools are increasingly recognized for their ability to support and transform pedagogical practices. This study investigates student teachers' perceptions of AI-enhanced pedagogy and its contribution to improving classroom teaching and learning within school classrooms. The study focuses on how AI shapes teaching strategies, lesson planning, student engagement, and overall classroom practices. The study involved 230 student teachers, which adopted a surveys method combining questionnaires and semi-structured interviews to gather both quantitative and qualitative insights. Although AI is becoming more visible in educational settings, empirical evidence regarding its practical application and perception at the pre-service teacher level remains limited. Findings reveal that student teachers generally hold positive perceptions of AI tools, recognizing their potential to foster interactive, differentiated, and adaptive learning environments that enhance efficiency. At the same time, respondents identified several challenges, including inadequate training, limited resources, and apprehensions about excessive reliance on technology. The study emphasizes the significance of training future educators with both digital literacy and pedagogical adaptability to effectively incorporate AI into their professional practice. It ultimately supports the responsible and sustainable integration of AI within teacher education programs, grounded in the lived experiences of student teachers and aimed at fostering educational innovation.

Keywords: artificial intelligence, pedagogical practices, student teachers, digital literacy, teacher education

Introduction

Artificial Intelligence is playing an increasingly influential role in education by supporting lesson design, instruction, assessment, and student monitoring (Luckin, 2017; Holmes et al., 2022). As schools adopt AI-driven tools, teachers are expected to integrate them thoughtfully while addressing pedagogical and ethical concerns (Popenici & Kerr, 2017; Williamson & Eynon, 2020). Teachers' perceptions and readiness significantly influence whether AI meaningfully enhances learning or merely automates existing practices (Zawacki-Richter et al., 2019). Although many teachers acknowledge that AI can enhance learner engagement, feedback, and differentiation, ongoing concerns remain related to data security, algorithmic bias, and the evolving professional responsibilities of teachers (Fütterer et al., 2022; Kessler, 2023). These issues are particularly significant for student teachers, who are still forming their professional

identities (Flores, 2020). However, research focusing specifically on student teachers' perceptions of AI-enhanced pedagogy remains limited, highlighting the necessity for further investigation that can inform effective and responsible AI-oriented teacher education (UNESCO, 2021; Holmes et al., 2019).

Review of Related Literature
Artificial Intelligence in Teaching and Learning
Artificial Intelligence (AI) is reshaping education by introducing intelligent tutoring systems, adaptive learning platforms, and automated assessment tools that deliver personalized instruction at scale (Zawacki-Richter et al., 2019; Holmes et al., 2019). These technologies analyze student data in real-time to adjust content difficulty, provide instant feedback, and identify learning gaps, significantly improving outcomes (Xie et al., 2019; Chen et al., 2020). Beyond individual support, AI reduces teachers' administrative workload by assisting with grading and lesson preparation, which provides educators with more time to focus on facilitation, relationship-building, and higher-order instruction (Roll & Wylie, 2016; Popenici & Kerr, 2017). In classroom practice, AI-enabled applications such as conversational agents, speech-to-text technologies, and data-driven learning analytics contribute to more dynamic and engaging learning experiences. These tools help accommodate diverse student populations, including multilingual learners and students with special educational needs (Ebadi & Amini, 2022; Zou et al., 2023). However, effective integration requires teachers to maintain pedagogical oversight, ensuring AI complements rather than supplants critical thinking, creativity, and human interaction (Selwyn, 2019; Holmes et al., 2022). Recent data shows 83% of K-12 teachers now use generative AI for planning and feedback, though concerns persist about over-reliance and equity gaps (Kessler, 2023).

AI-Focused Teacher Preparation
Teacher preparation programs increasingly incorporate AI literacy to equip pre-service educators with skills for technology-rich classrooms, emphasizing hands-on experience with tools alongside ethical and pedagogical training (UNESCO, 2021; Redecker, 2017). Studies reveal student teachers value AI for lesson design and differentiation but report significant gaps in formal preparation, only 40-50% receive systematic AI training despite widespread tool adoption (Futterer et al., 2022). Research highlights mixed readiness levels: while student teachers demonstrate emerging technical competence, they struggle with ethical decision-making and pedagogical adaptation, underscoring the need for curriculum reform (Zhang, 2025; Acquah, 2024). Professional development frameworks recommend scenario-based learning, AI ethics modules, and field experiences with smart classroom technologies to bridge these gaps (Darling-Hammond et al., 2017). Despite growing consensus on AI's necessity in teacher education, empirical studies remain limited, particularly regarding pre-service teachers' school-based perceptions and long-term integration strategies (Williamson & Eynon, 2020; Tan et al., 2024).

Aim of the Study
The study intended to explore student teacher's perceptions of the usefulness of AI-enhanced pedagogy in school classrooms. The following were the research questions:

- How do student teachers feel about using pedagogy enhanced through artificial intelligence in the classroom?
- How do student teachers perceive the pedagogical effectiveness of AI tools in strengthening teaching strategies, lesson planning, and student commitment?
- To what extent do student teachers recognize the instructional innovation potential and usability of AI tools in classroom teaching?
- What level of ethical awareness do student teachers demonstrate regarding AI-enhanced pedagogy implementation?

Methodology
The study employed a descriptive survey method. The sample consisted of 230 student teachers

selected through random sampling from various teacher education institutions. Data were collected using a 25-item structured questionnaire covering five dimensions: Attitude towards AI, Pedagogical Effectiveness, Instructional Innovation, Usability of AI Tools, and Ethical Awareness. Responses were measured on a four-point Likert scale, with negative items reverse-scored, yielding a maximum score of 100 to indicate a high level of positive perception. The questionnaire was developed through standard procedures, initially comprising 30 items and refined to 25 based on expert feedback. A pilot study with 50 student teachers established high reliability, with a Cronbach's alpha of 0.957. Content validity was ensured through expert review. The collected data were analysed using descriptive statistics to interpret participants' overall perceptions across the five dimensions.

Results and Discussion

This section presents the results from the survey aimed to explore student teachers' perceptions of artificial intelligence-enhanced teaching and learning in schools. The survey questionnaire consisted of 25 statements categorized into five dimensions: (1) Attitude towards AI, (2) Pedagogical Effectiveness, (3) Instructional Innovation, (4) Usability of AI Tools, and (5) Ethical Awareness. The learners' responses to these dimensions are presented sequentially to provide a comprehensive overview of their perceptions and insights regarding AI-enhanced pedagogy.

Table 1 Results of Participants' Perceptions towards AI-Enhanced Pedagogy

Statement	Mean	SD
1. I use AI-enhanced pedagogy in my teaching.	2.79	0.68
2. AI-enhanced pedagogy makes teaching more interesting than traditional methods.	2.80	0.71
3. AI-enhanced pedagogy is necessary in today's school education.	2.85	0.69
4. I enjoy trying new AI tools to enhance my teaching.	2.95	0.67
5. I feel confident experimenting with AI tools in the classroom.	2.80	0.75
6. AI tools help teachers explain concepts clearly.	2.78	0.72
7. AI-enhanced pedagogy improves students' understanding of lessons.	2.86	0.66
8. AI tools support diverse learning needs of students.	2.74	0.72
9. AI tools do not effectively improve learning outcomes.	2.47	0.78
10. Feedback from AI tools enhances teaching effectiveness.	2.75	0.71
11. AI tools encourage teachers to try new teaching strategies.	2.80	0.73
12. Using AI helps me design creative lesson plans.	2.84	0.71
13. AI tools make classroom learning more interactive.	2.77	0.72
14. AI tools allow teachers to develop unique learning activities for students.	2.81	0.73
15. AI limits creativity in teaching.	2.50	0.77
16. AI tools are easy to learn and use for teaching purposes.	2.91	0.77
17. AI tools can be easily integrated into regular classroom teaching.	2.72	0.81
18. Technical issues often prevent the effective use of AI in teaching.	2.06	0.66
19. AI tools save time in lesson preparation and teaching.	2.72	0.76
20. I can access AI tools anytime to support my teaching preparation.	2.79	0.69
21. Teachers should use AI tools responsibly in schools.	2.77	0.68
22. I am conscious of ethical issues around the usage of AI in teaching.	2.75	0.78
23. Teachers should ensure AI is used fairly in the classroom.	2.87	0.72
24. Overdependence on AI can negatively affect teaching professionalism.	2.76	0.74

25. Teachers must consider the ethical impact of AI on students.	2.80	0.70
In Total Perception Scale	*2.75*	*0.05*

Table 1 presents the mean and standard deviation scores of student teachers' perceptions towards AI-enhanced pedagogy across 25 statements. The overall mean score (M = 2.75) indicates a generally positive perception, while the relatively low standard deviation values reflect consistency in responses. With regard to the dimension of *'Attitude towards AI'*, encompassing statements 1–5, the average value scale midpoint (mean scale) is 2.84. Most items scored around or slightly above this midpoint, indicating that student teachers possess a moderately positive attitude towards AI-enhanced pedagogy in school education. Item 4 (M = 2.95) recorded the highest mean score, suggesting that student teachers enjoy trying new AI tools to enhance their teaching. Item 3 (M = 2.85) is slightly above the midpoint, reflecting their recognition of the necessity of AI in today's school education. However, items 1 (M = 2.79), 2 (M = 2.80), and 5 (M = 2.80) scored just below or close to the midpoint. This indicates a moderate level of actual use, interest and confidence in applying AI tools in classroom teaching. The average value scale midpoint for the dimension of *'Pedagogical Effectiveness'*, encompassing statements 6–10, is 2.72. Most items scored around or above this midpoint, indicating that student teachers generally perceive AI-enhanced pedagogy as effective in improving teaching and learning processes. Item 7 (M = 2.86) recorded the highest mean score, suggesting that student teachers believe AI-enhanced pedagogy improves students' understanding of lessons. Items 6 (M = 2.78), 8 (M = 2.74), and 10 (M = 2.75) also scored slightly above the midpoint, indicating a positive perception of AI tools in explaining concepts clearly, supporting diverse learning needs, and enhancing teaching effectiveness through feedback. However, item 9 (M = 2.47) scored below the midpoint. This statement is negatively framed, implying that respondents do not strongly agree that AI tools fail to improve learning

outcomes. This reflects a generally positive belief in the effectiveness of AI tools in education.

The average value scale midpoint for the dimension of *'Instructional Innovation'*, encompassing statements 11–15, is 2.74. Most items scored around or slightly above this midpoint, indicating that student teachers have a moderately positive perception of AI in promoting instructional innovation. Item 12 (M = 2.84) recorded the highest mean score, suggesting that student teachers believe AI helps them design creative lesson plans. Items 11 (M = 2.80), 13 (M = 2.77), and 14 (M = 2.81) also scored above the midpoint, indicating that AI tools encourage new teaching strategies, make learning more interactive, and support the development of unique learning activities. However, item 15 (M = 2.50) scored below the midpoint. This is a negative statement, which means most student teachers do not agree that AI limits creativity in teaching. This shows a generally positive view of AI's role in supporting innovation. The average value scale midpoint for the dimension of *'Usability of AI Tools'*, encompassing statements 16–20, is 2.64. Most items scored around or above this midpoint, indicating that student teachers generally perceive AI tools as usable and supportive in teaching tasks. Item 16 (M = 2.91) recorded the highest mean score, suggesting that student teachers find AI tools easy to learn and use for teaching purposes. Items 17 (M = 2.72), 19 (M = 2.72), and 20 (M = 2.79) also scored above the midpoint, indicating that AI tools can be integrated into classroom teaching, save time in lesson preparation, and are accessible when needed. However, item 18 (M = 2.06) scored well below the midpoint. This is a negative statement, which means most student teachers do not strongly agree that technical issues prevent the use of AI. This shows that technical barriers are not seen as a major problem by the respondents. The average value scale midpoint for the dimension of *'Ethical Awareness'*, encompassing statements 21–25, is 2.79. Most items scored around or slightly above this midpoint, indicating that student teachers demonstrate a moderately high level of ethical awareness regarding the use of AI in education. Item 23 (M = 2.87)

recorded the highest mean score, suggesting that student teachers strongly believe that AI should be used fairly in the classroom. Items 21 (M = 2.80) and 25 (M = 2.80) also scored above the midpoint, reflecting the view that teachers should use AI responsibly and consider its ethical impact on students. Items 22 (M = 2.75) and 24 (M = 2.76) scored slightly below the midpoint, indicating a moderate level of awareness of ethical issues and concerns about overdependence on AI affecting teaching professionalism.
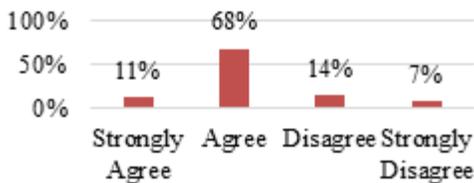

Figure 1 Participants' Attitude towards AI-Enhanced Pedagogy

Most student teachers (79%) agreed or strongly agreed that AI positively supports teaching, while 21% disagreed or strongly disagreed. This indicates that a majority of participants hold a favourable attitude toward AI-enhanced pedagogy, seeing its potential to improve teaching practices and classroom engagement, although some participants remain cautious about its effectiveness.
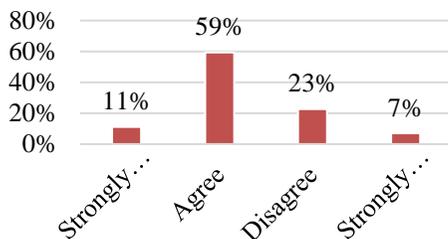

Figure 2 Participants' Perception of Pedagogical Effectiveness of AI-Enhanced Pedagogy

Most student teachers (70%) agreed or strongly agreed that AI enhances pedagogical effectiveness, while 30% disagreed or strongly disagreed. This suggests that a majority of participants perceive AI tools as beneficial for clarifying concepts, improving student understanding, and supporting effective teaching strategies. However, some participants expressed hesitations, possibly due to concerns about the consistency of AI in improving learning outcomes or challenges in integrating it into regular classroom practices.
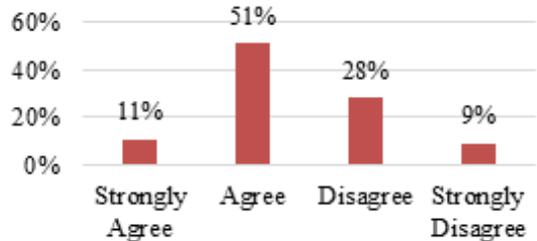

Figure 3 Participants' Perception of Instructional Innovation through AI-Enhanced Pedagogy

Most student teachers (62%) agreed or strongly agreed that AI supports instructional innovation, while 37% disagreed or strongly disagreed. This indicates that a majority of participants perceive AI tools as helpful in fostering creative lesson planning, encouraging new teaching strategies, and developing unique learning activities for students. Nevertheless, some participants expressed concerns, possibly due to issues such as AI limiting creativity, classroom applicability, or their own familiarity with using AI tools in innovative ways.
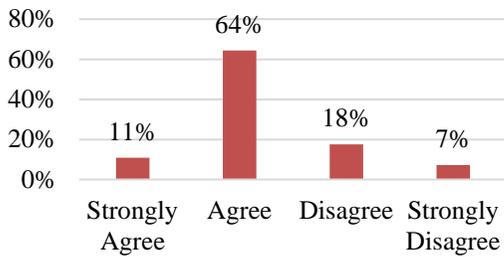
4. Usability of AI Tools

Figure 4 Participants' Perception of Usability of AI Tools in Teaching

Most student teachers (75%) agreed or strongly agreed that AI tools are usable and easy to integrate into teaching, while 25% disagreed or strongly disagreed. This suggests that a majority of participants perceive AI tools as accessible, user-friendly, and helpful in supporting lesson preparation and classroom instruction. Nevertheless, some participants expressed concerns, likely related to technical challenges or difficulties in seamlessly incorporating AI into regular teaching practices.
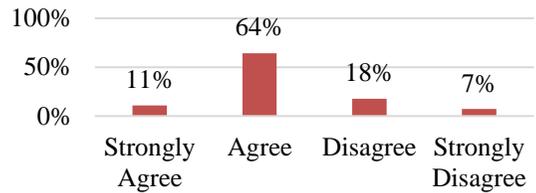
5. Ethical Awareness

Figure 5 Participants' Ethical Awareness in Using AI-Enhanced Pedagogy

Most student teachers (75%) agreed or strongly agreed that AI should be used responsibly and ethically in schools, while 25% disagreed or strongly disagreed. This indicates that a majority of participants are aware of the ethical considerations associated with AI in teaching, including fairness, responsible use, and the potential impact on students. Nevertheless, some participants expressed concerns, possibly related to uncertainty about how to implement AI ethically or the consequences of overreliance on AI in classroom practices.

Table 2 Correlation Matrix of Student Teachers' Perceptions of AI-Enhanced Pedagogy between Dimensions

Dimensions	Attitude towards AI	Pedagogical Effectiveness	Instructional Innovation	Usability of AI Tools	Ethical Awareness
Attitude towards AI	1				
Pedagogical Effectiveness	.761**	1			
Instructional Innovation	.767**	.706**	1		
Usability of AI Tools	.700**	.622**	.693**	1	
Ethical Awareness	.754**	.696**	.743**	.750**	1

**Correlation is significant at the 0.01 level.

Table 2 shows the correlation analysis among the five dimensions of student teachers' perceptions of AI-enhanced pedagogy. All dimensions show strong and positive correlations with one another, and all relationships are statistically significant at the 0.01 level. Attitude towards AI is highly correlated with Instructional Innovation (r = .767) and Pedagogical Effectiveness (r = .761), indicating that positive

attitudes toward AI are closely associated with perceptions of innovative and effective teaching practices. Usability of AI tools also demonstrates substantial correlations with all other dimensions, indicating that general opinions about AI integration are greatly influenced by usability. Similarly, Ethical Awareness is strongly related to the remaining dimensions, highlighting that responsible and ethical considerations are integral to participants' acceptance of AI-enhanced pedagogy. The results suggest a coherent and interconnected perception structure among student teachers concerning the use of AI in education.

Conclusion

The future integration of AI in education depends heavily on student teachers, who are still developing their professional identities and teaching beliefs. The study examined student teachers' perceptions of AI-enhanced pedagogy and revealed an overall positive outlook to the use of AI in school education. Most participants agreed that AI supports effective teaching, improves classroom engagement, promotes instructional innovation, and is easy to use in regular teaching practices. While a small proportion of participants expressed reservations, this reflects cautious evaluation rather than rejection of AI. The significant positive relationships among all dimensions indicate that favourable attitudes toward AI are closely linked with perceptions of its pedagogical value, innovative potential, usability, and ethical responsibility. Overall, the findings suggest that student teachers are receptive to AI-enhanced pedagogy and are prepared to adopt it meaningfully when supported through proper training and ethical guidance.

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