

Familiarity and perception of AI in Teacher Education: factors influencing its acceptance and use

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Abstract: Artificial Intelligence (AI) is emerging as a potentially transformative resource in teacher education, yet its adoption is influenced by multiple factors. This study examines pre-service teachers' perceptions of AI, exploring key concerns, perceived limitations, and the role of familiarity with this technology. Particular attention is given to the need for human validation in automated decisions and the aspects requiring improvement to foster the effective integration of AI in teacher training. The findings provide insights to guide educational policies and promote a conscious and critical use of AI in knowledge construction.

Keywords: Artificial intelligence; teacher training; perception; human validation

1. Artificial Intelligence in Teacher Education

Defining the role of AI in teacher education requires considering both its practical applications and the theoretical implications of its integration into pedagogical practices. Artificial Intelligence in Education (AIED) represents a growing research field exploring the potential of AI in personalizing learning, analyzing educational data, and creating adaptive and multimodal learning environments (Homes & Tuomi, 2022). AI applications in education are diverse and include: the development of personalized learning systems; automated assessment tools to assist teachers; facial recognition algorithms; serious games and simulations; intelligent tutoring systems or agents; and personalized learning environments. Perla and colleagues (2024) highlight contemporary educational research's interest in formalizing a so-called 'algor-ethic' theoretical framework, which combines perspectives from international studies on Practice Analysis and Artificial Intelligence in Education. Within this framework - centered on personalized learning, digital literacy (data and algorithmic literacy through machine learning and deep learning techniques), and the integration of AI into school curricula (Parson et al., 2020) - research institutions are increasingly urged to experiment with the design of interactive and adaptive learning environments and the use of immersive technologies to enhance student engagement (Touretzky & Gardner-McCune, 2022; European Commission, 2022). The goal is to ensure greater personalization, flexibility, and adaptation to individual learning needs through indi-



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virtualized feedback systems, intelligent tutoring, learning data analysis, and automated assessments while addressing challenges related to accessibility, equity, and ethical implications of AI tools, as emphasized by the EU Regulation 2024/1689. The ethical implications of AI in teacher education are the subject of growing academic debate. The automation of assessments, the use of facial recognition systems, the adoption of serious games and simulations, and the development of intelligent tutoring systems raise concerns about privacy, algorithmic transparency, and the risk of discriminatory bias. From a training perspective, there is a shift from mere digital literacy (rooted in educational technology and media literacy education) to a deeper understanding of media as complex systems of representation and cultural signification. Specifically, regarding teacher education, it is crucial to rethink training approaches in light of the opportunities and challenges posed by AI, promoting the conscious use of educational technologies and a critical reflection on their long-term effects within the school context.

2. Familiarity with AI: Prior Experience and Digital Education

Although considered a potentially transformative resource, the effective adoption of artificial intelligence in teacher education is influenced by several factors, including perceived usefulness and ease of use, concerns, perceived limitations, and familiarity with this technology (Perla, Agrati, & Beri, 2025). Social factors, performance expectations, and facilitating conditions play a crucial role in teachers' predisposition to use AI in education (Chounta et al., 2022).

Teachers' familiarity with AI is critical in their willingness to adopt these tools, as it reduces resistance and increases trust in digital technologies. Teachers with greater exposure to and understanding of AI technologies are more likely to recognize their benefits and integrate them strategically and effectively into teaching practices. In contrast, those with little direct experience and low familiarity may perceive AI as complex and disconnected from educational needs, fostering resistance and concerns (Romero & Heiser, 2023).

UNESCO's AI Competency Framework for Teachers (2024) highlights the importance of digital education aimed at familiarizing teachers with AI tools, ensuring their responsible, informed, and effective use while minimizing the risks associated with AI for students and society. Prior experience and specific training influence not only the ability to adopt AI-based tools but also the perception of their impact on teaching.

Despite the potential benefits of intelligent technologies in optimizing teaching processes, several factors limit the adoption of AI in teacher education. These include ethical and pedagogical concerns about the complexity of the technology and the reliability of algorithms, the need for specific training, and the perception that AI could replace the human role in education, reducing teachers' decision-making autonomy. In this regard, Romero et al. (2024) emphasize the importance of a thoughtful and human-centered integration of AI in education, promoting an approach that values the decision-making role of teachers and students. The concept of "hybrid intelligence" proposed by the authors highlights collaboration between human and artificial intelligence, aiming to enrich the educational experience without replacing human

contribution. Their manifesto also encourages a creative use of AI in teaching, fostering a balance between technological innovation and ethical principles.

UNESCO's AI Competency Framework for Teachers (2024) also stresses the need for clear regulatory frameworks to ensure the ethical use of AI, as highlighted in the "Ethical Guidelines for Educators on the Use of Artificial Intelligence" by the European Commission (2022). UNESCO further asserts that AI should support rather than replace human decision-making, promoting a critical and conscious approach to educational technologies. Respect for human rights and cultural diversity should serve as guiding principles in the design and use of AI-based tools in education (Holmes & Tuomi, 2022). For these reasons, integrating targeted training programs into teacher preparation curricula is essential to foster the effective integration of AI into school contexts.

3. Factors influencing the perception of AI in Teacher Education: trust

The importance of trust in AI is growing (Lukyanenko et al., 2022), as also emphasized by the Ethical Guidelines on Artificial Intelligence and Data Usage in Teaching and Learning (European Commission, 2022). However, research on trust in AI within educational contexts, particularly in teacher education, remains limited (Kizilcec, 2023).

Vibert et al. (2024) explore trust - understood as the willingness to accept vulnerability toward another entity - that teachers place in AI-based educational technologies (AI-EdTech). Their findings highlight that teachers' trust in AI-EdTech is influenced by multiple factors, including self-efficacy, AI understanding, cultural values, and geographic context. Specifically, they demonstrate that perceived benefits and concerns act as antecedents of trust, which are in turn shaped by self-efficacy and AI comprehension. These results align with previous studies emphasizing the importance of self-efficacy and AI understanding in the adoption of educational technologies (Cukurova et al., 2023; Chounta et al., 2022). Furthermore, they highlight the need to consider various factors—such as cultural differences, uncertainty avoidance, long-term orientation, and masculinity—at multiple levels, including the individual, school, and cultural context, to promote the ethical and effective implementation of AI in education (Kelly et al., 2022; Rogerson et al., 2022).

Nazaretsky et al. (2022) analyze teachers' trust in AI-EdTech and propose a professional development program (PDP) to enhance it. Their study identifies eight factors influencing teachers' trust in AI-EdTech adoption, including perceived benefits, the lack of human-like characteristics in AI, algorithmic transparency, and reliability. To address these challenges, the authors developed a PDP that provides foundational AI knowledge, fosters self-efficacy, and considers cultural and geographical differences. Discourse analysis of PDP participants revealed increased trust and willingness to integrate AI-EdTech into teaching practices. Ultimately, the study underscores the importance of training programs that address teachers' concerns and enhance their AI understanding to support the effective adoption of AI-based educational technologies.

Chee et al. (2023) develop a competency framework for AI literacy, highlighting how learning needs vary across different student groups. Their study analyzes the skills required for critical and informed interaction with AI, identifying three main

dimensions: conceptual understanding of AI, technical skills, and ethical considerations. The authors propose a progressive learning pathway in which beginners become familiar with basic concepts, intermediate users develop practical application skills, and advanced learners refine critical thinking and expert use of AI. The framework emphasizes the need to tailor AI education to different competency levels and educational contexts, promoting inclusive and targeted technological literacy.

4. Objective and Methodology of the Research

This study presents the results of an exploratory research conducted in 2025, involving 189 pre-service teachers enrolled in the Primary Education Sciences degree program at the University of XXX (Italy). The research was carried out as part of a laboratory activity within the course Fundamentals and Didactics of Biology and Ecology, where students were required to develop a Learning Unit following a structured format provided by the professor. Subsequently, they had the opportunity to evaluate their work through feedback generated by artificial intelligence. The AI was prompted to act as a virtual assistant specializing in educational assessment, specifically trained to analyze and provide feedback on learning units. It assessed the adequacy of the proposed learning activities based on emerging educational needs, the structure of the Uda, the didactic activities and authentic tasks, and the clarity of the evaluation grids. Additionally, to ensure that the AI's feedback was aligned with national curricular programming, the Indicazioni Nazionali per il primo ciclo (National Guidelines for the First Education Cycle, D.M. 254/2012) were provided as reference material.

The AI's primary objective was to deliver analytical and motivational feedback in accordance with the principles of assessment for learning. Two different AI models, ChatGPT and Claude, were utilized, as both allowed for the attachment and analysis of documents. This study explores two key aspects related to the use of AI by future teachers: their familiarity with AI tools and their concerns regarding their implementation. Specifically, the research aims to examine the factors influencing the adoption of AI-driven tools among future educators. A mixed-methods approach was adopted, integrating both qualitative and quantitative data collection and analysis techniques. Data were gathered through a CAWI (Computer-Assisted Web Interviewing) questionnaire, which included multiple-choice and open-ended questions (N = 189; response rate: 95.8%). Due to space limitations, not all questionnaire items are presented in this publication.

The questionnaire was structured into five sections designed to collect data on students' perceptions, engagement, and satisfaction with the experiment. It comprised 42 questions: 32 closed-ended questions (multiple-choice and Likert scale) and 10 open-ended questions (see Table 1). Regularly attending students completed all five sections, whereas non-attending students completed four out of five sections. A total of 189 pre-service teachers participated in the survey, with a predominantly female sample (females N = 182; 96.3%; males N = 6; 3.2%; no response N = 1; 0.5%). Most respondents were between the ages of 19 and 44 (N = 183; 96.9%). Regarding student status, 63% (N = 119) were attending students, and 81% (N = 153) had no prior teaching experience.

The questionnaire focused on four main dimensions: *Cognitive*: ability to design and adapt learning units, use digital tools, and apply didactic problem-solving; *Meta-cognitive*: awareness of one's competencies, self-assessment of progress, and reflection on the effectiveness of received feedback; *Emotional*: confidence and trust in one's teaching and technological skills; *Technological*: use of ICT and AI in teaching and learning.

Specifically, the study investigated two specific objectives: for Objective 1, open-ended questions collect personal opinions, while the Likert Scale is used to quantify the perceived usefulness of feedback, thus providing both qualitative and quantitative data. Objective 2, Scale Question (1-10, Strongly disagree – Strongly agree), focuses on concerns and doubts regarding the use of AI in teacher education, aiming to understand how to mitigate apprehensions that hinder AI acceptance in teaching practices.

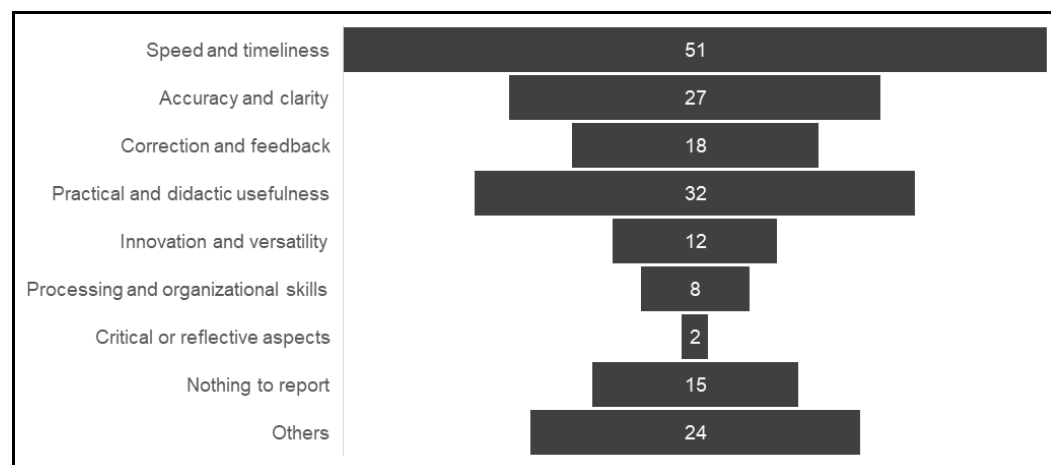
5. Data analysis: familiarity with AI, past usage, and perceived usefulness

In this section, the data analysis and outcomes related to familiarity with and use of artificial intelligence tools are presented, as assessed through the CAWI questionnaire. The responses to the survey were analyzed using both qualitative and quantitative approaches. The collected data were processed using Microsoft Excel software.

Open-ended questions were categorized to standardize the collected data. The analysis revealed that over 94% of students believe digital tools influence their educational path, and 88.36% of respondents have used a Large Language Model (LLM) for both personal and academic purposes. Furthermore, 97.88% of future teachers believe that artificial intelligence models can be useful in contexts beyond education, demonstrating a good understanding of the potential of AI-integrated tools.

Regarding the perception of using tools like ChatGPT 3.5 or Claude 3.5 Haiku during the course, it was found that the most appreciated aspect was the speed at which they provide answers (27%) and support (17%), making the study process more efficient and immediate. Particular attention was also given to the accuracy of information and the reliability of suggestions provided by AI (14%), showing how these tools, if properly programmed, can serve as valuable learning aids. Some students highlighted the AI's ability to adapt to different needs (12%), customizing responses and offering a more dynamic interaction. This leads to the perception of artificial intelligence as a resource to improve the learning process through targeted and interactive support. However, some resistance remains, as a small portion (1%) of respondents reported not finding significant benefits in using AI or not using it actively.

Figure 1. Future Teachers' Perception of AI in Learning



The quantitative analysis also took into account the perception of the effectiveness of the feedback provided by artificial intelligence, assessed on a scale from 1 (strongly disagree) to 10 (strongly agree). Specifically, aspects related to the completeness and understandability of the feedback received were considered. Additionally, the impact on error comprehension and support for the student's critical reflection were examined. The evaluation of the feedback is generally positive: a certain uniformity in the scores assigned by the students emerges. The limited variability in the scores reduces the likelihood that the evaluations were influenced by extremely diverse individual experiences.

Table 1. Evaluation of AI Feedback: Clarity, Usefulness, and Impact

Rate on a scale from 1 = strongly disagree to 10 = totally agree	Mean	Mode	Median	St. Dev.
The feedback provided by the AI was detailed.	8.62	10	9	1.66
The feedback provided by the AI was understandable.	8.9	10	10	1.54
The AI feedback improved my understanding of the errors to correct.	8.8	10	9	1.5
The AI feedback helped me critically reflect on my teaching choices.	8.5	10	9	1.71

This article aimed to assess the extent to which familiarity with AI influences the perception of human validation of outputs generated by LLM systems. A Welch's t-test for independent samples was conducted to compare the means of two independent groups - students who use AI and students who do not - in relation to a continuous variable regarding the perceived need for human validation. The null hypothesis (H0) assumes that there are no differences between the two groups. The results of the statistical analysis show that familiarity with AI does not have a statistically significant effect on the perception of the need for human validation in feedback generated by artificial intelligence ($t = 1.91$, $p = 0.0656$, two-tailed). Students who have already used AI tools do not differ significantly from those who have never used them regarding the belief that AI feedback should be accompanied by human intervention. The inability to reject the null hypothesis suggests that direct experience with AI does not significantly alter the perception of the human role, which remains central and pivotal in the process of hybridization with artificial intelligence.

6. Analysis of concerns and perceived limitations of AI

The analysis conducted aimed to highlight some of the concerns that hinder the use of artificial intelligence (AI) in education. Descriptive statistics reveal an uncertain perception regarding the reliability and ethics of AI-generated feedback. The item "I had doubts about the reliability of AI feedback" received an average score of 5.62 out of 10, while the item "I had doubts about the ethics of AI feedback" recorded an average of 5.22 out of 10. These results indicate that students do not express a clear rejection of AI feedback, but rather a widespread uncertainty, with responses distributed heterogeneously. The high standard deviation suggests the presence of distinct groups: some students perceive AI as reliable and neutral, while others raise concerns related to transparency, consistency, and the potential for bias in the generated suggestions.

Table 2. Concerns About AI Feedback: Reliability and Ethical Considerations

Rate on a scale from 1 = strongly disagree to 10 = totally agree.	Mean	Mode	Median	St. Dev.
I am concerned about the idea that AI could completely replace human interaction in education.	7.08	10	8	2.79
I had doubts about the reliability of AI feedback.	5.62	1	6	3.16
I had doubts about the ethics of AI feedback.	5.23	1	5	3.13
I believe that AI feedback should always be accompanied by human validation.	8.64	10	9	1.8

This variability in opinions suggests that doubts about AI are not uniformly widespread, but rather depend on factors such as previous experience, level of digital literacy, and the context of use. Specifically, uncertainty regarding the ethics of AI feedback may stem from a perceived lack of transparency in the evaluation criteria adopted by AI, or from concerns that the system does not account for the pedagogical specifics and contextual variables of education. Additionally, the distinction between

technical errors and subjective interpretation may contribute to greater difficulty in assessing the actual reliability of the feedback received.

An inferential investigation was conducted using an independent samples t-test, which showed that students who do not use AI tools express a significantly higher concern regarding the possibility that AI could completely replace human interaction in education ($M = 8.68$) compared to those who already use these tools ($M = 6.92$; $p = 0.000545$). The Cohen's d index (0.6417) indicates a moderate effect, suggesting that, although the difference is not extreme, it is still significant. These data indicate that direct familiarity with AI helps mitigate concerns and reduces the perception of AI as a threat to the traditional educational relationship.

Finally, to further explore students' perceptions of the limitations of AI, the item "How could AI feedback be improved?" was analyzed, providing a qualitative perspective on the identified critical points. The results suggest that the main areas for improvement include a greater transparency in the evaluation criteria, more advanced personalization of feedback, and better integration with human support.

7. Conclusions and implications

The hybridization of artificial intelligence (AI) in education, particularly in teacher training, is becoming an increasingly pervasive aspect of educational practice, characterized by both significant potential and inherent challenges. This study contributes to the ongoing discourse on AI integration in initial teacher education, analyzing both the familiarity and trust that educators have with AI tools, as well as the resistance and concerns surrounding their use. To promote greater adoption of AI in teacher education, it is crucial to address teachers' concerns related to the usability of AI platforms, the transparency of algorithms, and the assurance that AI will support, rather than replace, the role of the teacher. These concerns are especially relevant in light of the perceived need for more transparency in AI-generated feedback, greater personalization, and better integration of human support.

The analysis of the survey data revealed that familiarity with AI does not significantly alter students' perceptions of the need for human validation in AI-generated feedback ($t = 1.91$, $p = 0.0656$). Despite this, concerns about reliability, ethics, and the risk of replacing human interaction with AI remain prevalent, particularly among students with limited experience using AI tools. Specifically, students who have not used AI tools expressed significantly higher concerns about AI replacing human interaction in education ($M = 8.68$) compared to those who had used AI tools ($M = 6.92$; $p = 0.000545$). These findings suggest that while AI has the potential to enhance educational processes, its integration into teaching practices requires careful consideration of its limitations, particularly in maintaining the centrality of human involvement.

Furthermore, the study highlights the need for AI systems to be more transparent in their evaluation criteria and provide feedback that is personalized to the student's needs, ensuring a closer integration of human support with AI tools. The concept of "AI-Augmented Teaching" emerged as central to the findings, where AI serves as a support to, not a replacement for, teachers. This aligns with the perceptions of students who indicated that AI-generated feedback, when accompanied by human validation, could be a valuable educational tool. The study emphasizes the importance of human supervision in ensuring the reliability of educational decisions and mitigating concerns over the ethical implications of AI in education.

In line with the literature (Romero et al., 2024), the findings underscore the importance of fostering a regulated approach that preserves teachers' professional autonomy while balancing automation and human control. Future studies could further investigate how different levels of familiarity with AI influence teachers' and students' perceptions of AI tools, and explore how AI can complement human educators to enhance teaching and learning. As teacher education programs incorporate AI, it will be essential not only to develop technological competencies but also to critically reflect on the interaction between humans and machines. This will help ensure responsible and effective AI integration in education, promoting trust in AI while preserving the essential human elements in the educational process (Zawacki-Richter et al., 2019).

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